FURUNO

OPERATOR'S MANUAL

COLOR SCANNING SONAR

MODEL FSV-84

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

(Elemental Chlorine Free)

The paper used in this manual is elemental chlorine free.

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 Printed in Japan

FIRST EDITION : SEP. 2006
B : FEB. 20, 2007

Pub. No. OME-13290

(DAMI) FSV-84

00015742711

IMPORTANT NOTICES

- This manual is intended for use by native speakers of English.
- No part of this manual may be copied or reproduced without written permission.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications are subject to change without notice.
- The example screens (or illustrations) shown in this manual may not match the screens you see on your display. The screen you see depends on your system configuration and equipment settings.
- Store this manual in a convenient place for future reference.
- FURUNO will assume no responsibility for the damage caused by improper use or modification of the equipment (including software) by an unauthorized agent or a third party.
- When it is time to discard this product it must be done according to local regulations for disposal of industrial waste. For disposal in the USA, refer to the Electronics Industries Alliance (http://www.eiae.org/).

⚠ SAFETY INSTRUCTIONS

The operator of this equipment must read the safety instructions before attempting to operate the equipment.

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠ Warning, Caution   ⃠ Prohibitive Action   ❗ Mandatory Action

⚠ DANGER



Keep away from raise/ower shaft in hull unit when it is moving.

Gears in hull unit will cause seriou injury.

⚠ WARNING

Do not open the equipment.

Only qualified personnel should work inside the equipment.

Immediately turn off the power at the switchboard if water leaks into the equipment or something is dropped into the equipment.

Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.

Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.

⚠ WARNING

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Do not install the equipment where it may be subject to rain or water splash.

Fire or electrical shock can result if water leaks in the equipment.

Use the proper fuse.

Use of a wrong fuse can result in damage to the equipment or cause fire.

Do not operate the equipment with wet hands.

Electrical shock may result.

Do not place liquid-filled containers on the top of the equipment.

Fire or electrical shock can result if a liquid spills into the equipment.

Turn off the power immediately if you feel the equipment is behaving abnormally.

Turn off the power at the switchboard if the equipment becomes abnormally warm or is emitting odd noises. Contact a FURUNO dealer or agent for advice.

⚠ CAUTION

Maximum speed while the transducer is projected and being raised or lowered is as below, to prevent damage to the transducer.

	Projected	Raising/ Lowering
800 mm stroke	Max. 18 kt	Max. 15 kt
1100 mm stroke	Max. 18 kt	Max. 15 kt

Replace anticorrosion zinc plate yearly.

Corrosion between the main shaft and transducer may result if not replaced, allowing water leakage and/or loss of transducer.

⚠ CAUTION

Observe the following precautions when using industrial use lubricant.

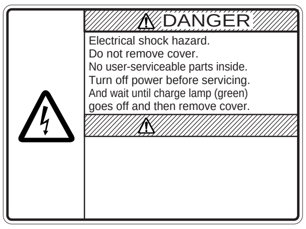
Precautions
- Keep lubricant away from eyes. Wear protective goggles when working with the lubricant. The lubricant can cause inflammation of the eyes.
- Do not touch the lubricant. Wear protective gloves when working with the lubricant. The lubricant can cause inflammation of the skin.
- Do not ingest the lubricant. Diarrhea and vomiting may result.
- Keep the lubricant out of reach of children.

Emergency procedures
- If the lubricant enters eyes, flush with clean water about 15 minutes. Consult a physician.
- If the lubricant contacts skin, flush area with clean water.
- If the lubricant is ingested, see a physician immediately.

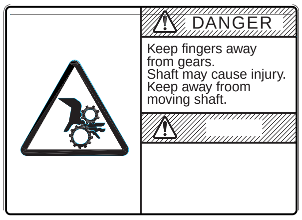
Disposal of lubricant and its container
Dispose of the lubricant and its container in accordance with local regulations. If you are unclear about the disposal procedure, contact a FURUNO agent or dealer for advice.

WARNING LABELS

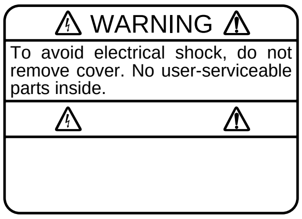
Warning labels are attached to the units of the system. Do not remove the labels.
If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.



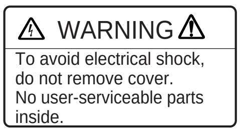
Name: Warning Label
Type: 10-079-6144
Code No.: 100-310-880



Name: Warning Label
Type: 10-071-5313
Code No.: 100-291-160



Name: Warning Label (1)
Type: 86-003-1011-1
Code No.: 100-236-231



Name: Warning Label (2)
Type: 03-129-1001-1
Code No.: 100-236-741

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TABLE OF CONTENTS

FOREWORD

A Word to the Owner of the FURUNO FSV-84

Congratulations on your choice of the FURUNO FSV-84 Color Scanning Sonar. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For over 50 years FURUNO Electric Company has enjoyed an enviable reputation for quality marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless operated and maintained properly. Please carefully read and follow the recommended procedures for operation and maintenance.

Thank you for considering and purchasing FURUNO equipment.

Features

The FSV-84 is a full-circle, multibeam electronic color scanning sonar which detects and displays fish schools on a 21-inch non-glare, high-resolution color monitor. (System also available without monitor.)

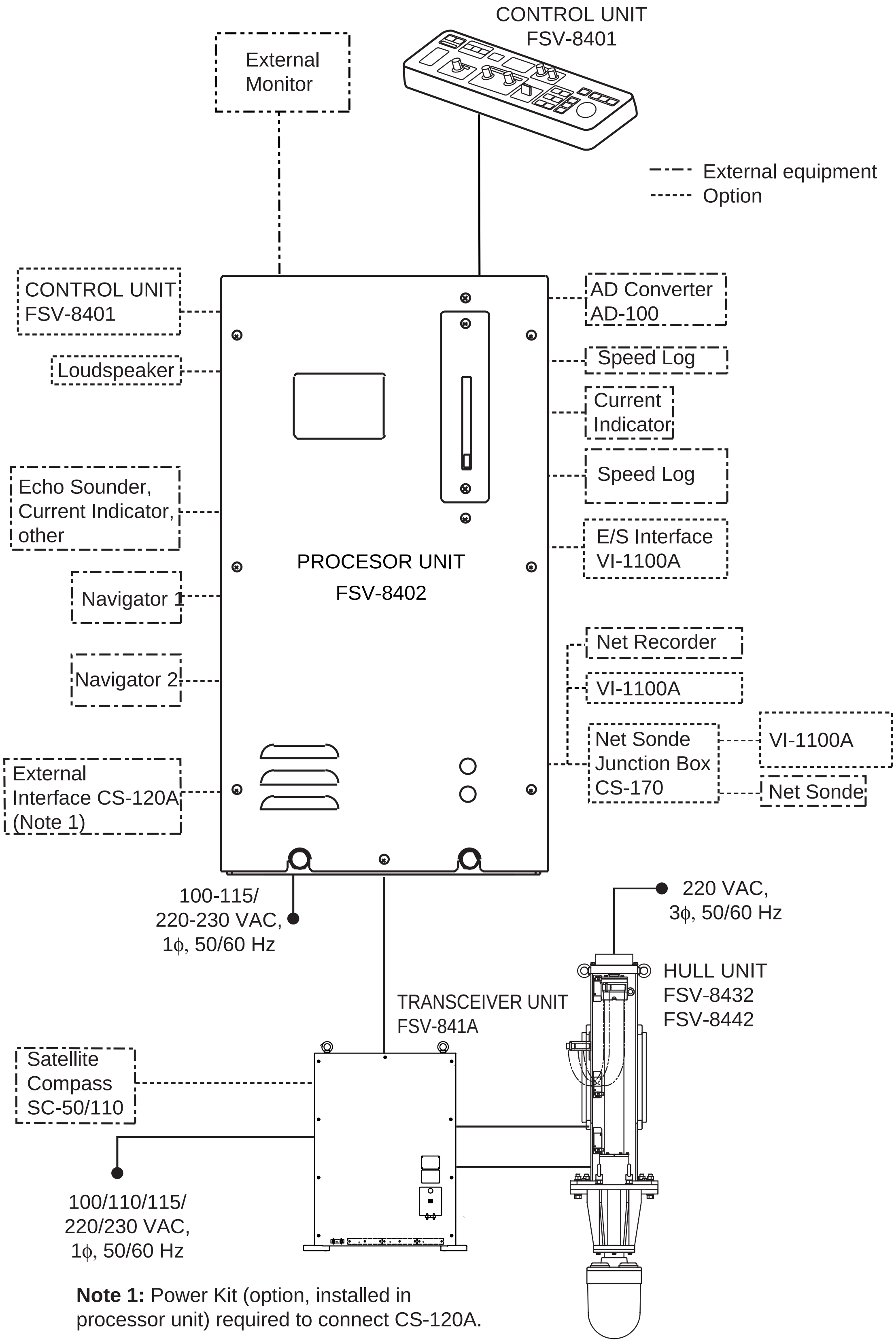
The main features of the FSV-84 are

- Cylindrical + sphere transducer provides 90 degrees vertical detection.
- Vivid 32-color echo strength dependent display for improved recognition of bottom, fish school concentration, distribution and volume.
- Fish schools can be searched from horizontal (range direction), vertical (depth direction) with vertical and half-circle features.
- Function keys for direct access to desired menu item.
- User programs for one-touch setup of equipment.
- Menu-driven operation.
- Fish histogram shows signal strength distribution of echo within estimate mark.
- Various marks and alphanumeric fishing and navigation information for intuitive operation.
- Memory cards for storage and replay of picture and settings.

- Audio function allows monitoring of echoes along user-selected area through built-in loudspeaker.
- Fish mark estimates fish speed.
- Fish estimate feature compares volume of two fish schools.
- Target lock automatically tracks fish school.
- Net course mark shows probable drift of net against tide.

SYSTEM CONFIGURATION

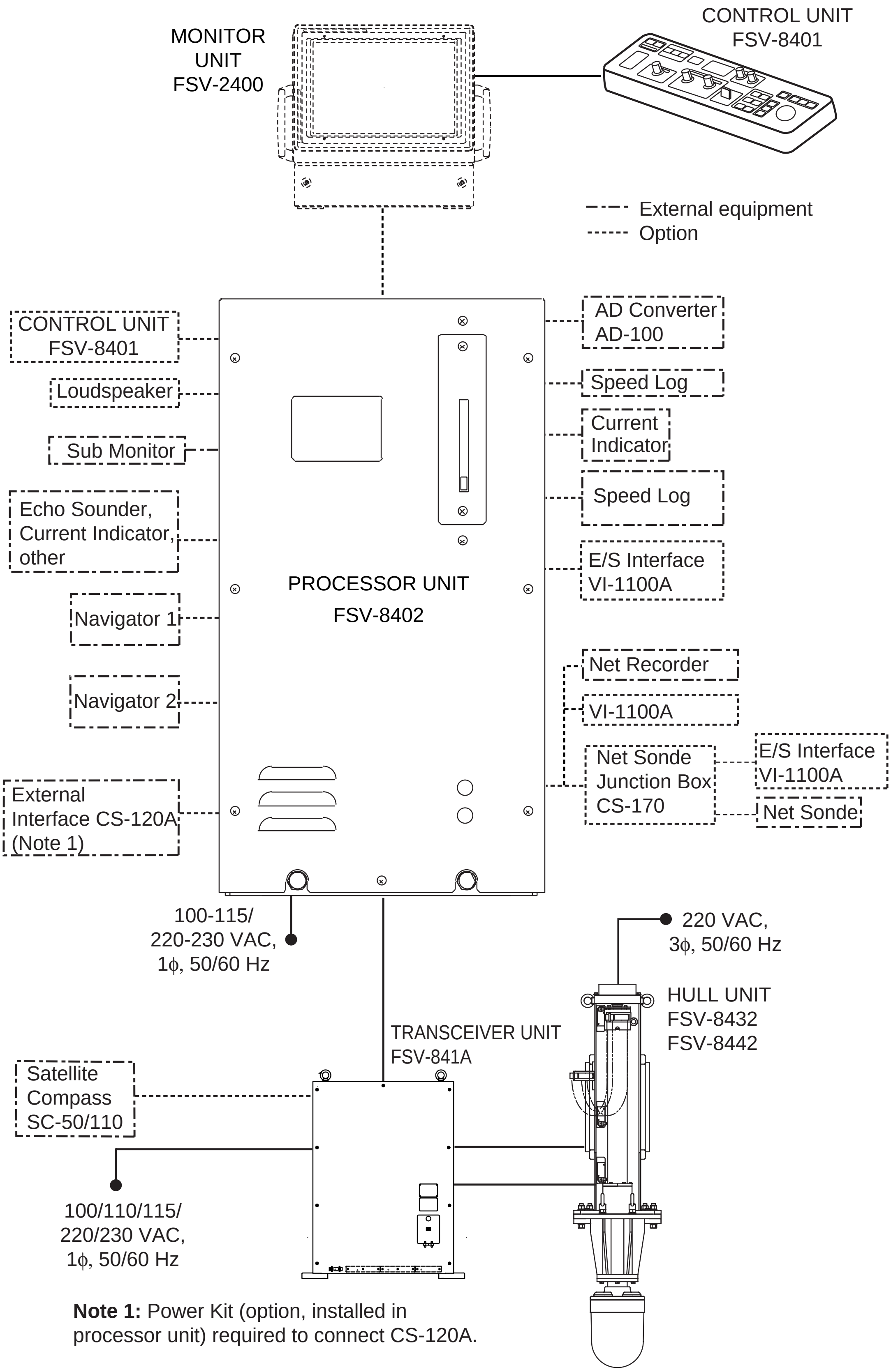
System with locally supplied monitor



Note 1: Power Kit (option, installed in processor unit) required to connect CS-120A.

Blackbox type configuration

System with FURUNO monitor



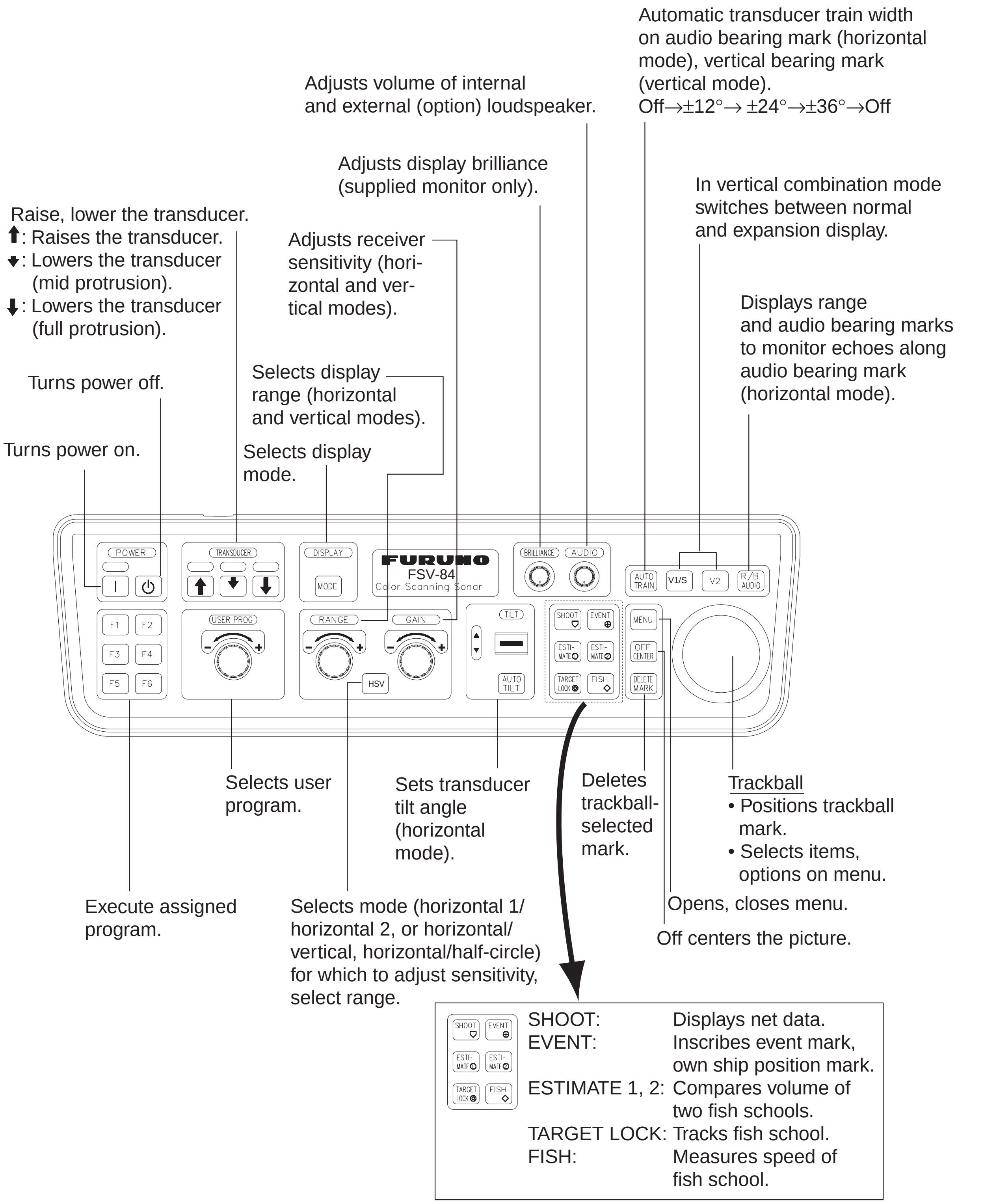
Note 1: Power Kit (option, installed in processor unit) required to connect CS-120A.

Standard type configuration

1. OPERATIONAL OVERVIEW

1.1 Control Description

Note that the [AUDIO] control is not operative from the 2nd control unit when two control units are installed.



Control unit

1.2 Turning the Power On/Off

1.2.1 Turning the power on

Press the POWER ON (|) switch. A beep sounds, the lamp above the switch lights, and the last-used mode is presented.

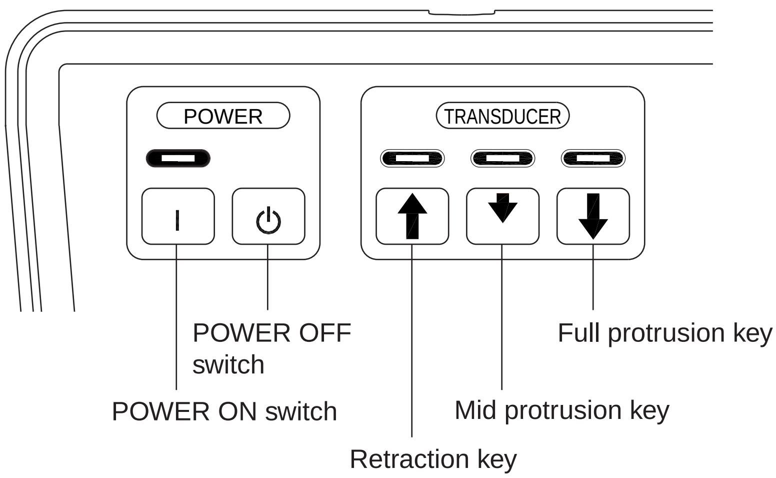
1.2.2 Turning the power off

1. First retract the transducer with the [🡅] key. The lamp above the switch blinks while the transducer is being raised and lights steadily when it is fully raised.

   Note: While raising the transducer, the ship speed must be no more than 15 kts to prevent damage to the transducer and hull unit.

2. Press the POWER OFF (⏻) switch for more than one second, after the [🡅] key lights steadily.

   Note: The transducer is automatically retracted into the tank if the POWER OFF (⏻) switch is pressed before retracting the transducer. However, for safety purposes, make it a habit to retract the transducer before turning off the power.



POWER & TRANSDUCER controls

1.3 Lowering, Raising the Transducer

⚠ CAUTION

Maximum speed while the transducer is projected and being raised or lowered is as below, to prevent damage to the transducer.

	Projected	Raising/ Lowering
800 mm stroke	Max. 18 kt	Max. 15 kt
1100 mm stroke	Max. 18 kt	Max. 15 kt

1.3.1 Lowering the transducer

With the boat at the fishing ground, press the [⬇] or [♦] key. The lamp above the key pressed blinks during lowering and lights when the transducer is completely lowered to selected protrusion distance. It takes about 21 seconds for full protrusion in case of 800 mm stroke and 28 seconds in case of 1100 mm stroke. In normal use fully lower the transducer. If the transducer becomes entangled in the net for some reason, partially raise the transducer with the [♦] key. This raises the transducer by 400 mm.

1.3.2 Raising the transducer

Press the [⬆] key to raise the transducer. The lamp above the switch blinks while the transducer is being raised and lights steadily when it is fully raised.

1.4 Screen Brilliance

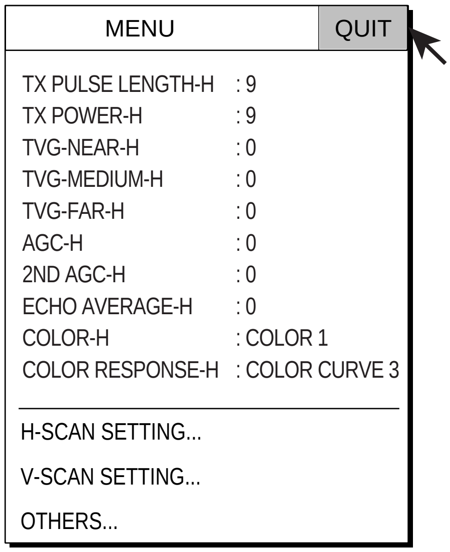
The [BRILLIANCE] control adjusts screen brilliance. Adjust it to suit lighting conditions.

Note: The brilliance of an external monitor cannot be adjusted with the [BRILLIANCE] control. Use the associated control on the monitor.

1.5 Control Panel Dimmer

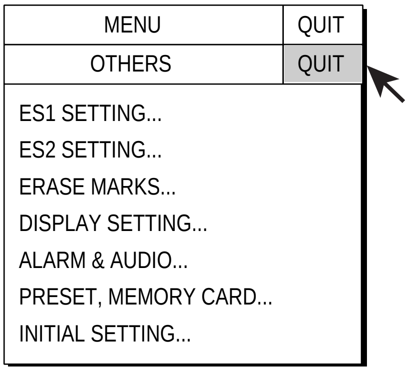
The dimmer for the control panel may be adjusted on the DISPLAY SETTING menu as below.

1. Press the [MENU] key to open the main menu.



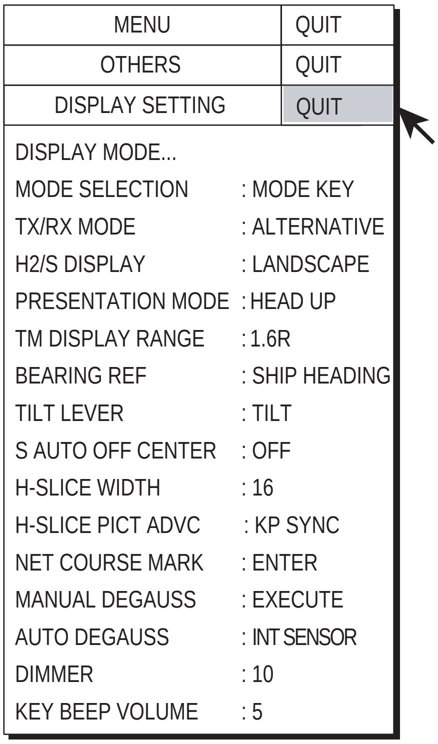
Main menu (default)

2. Use the trackball to select OTHERS and press the [MENU] key.



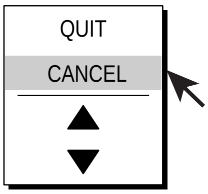
OTHERS menu

3. Use the trackball to select DISPLAY SETTING and press the [MENU] key.



DISPLAY SETTING menu

4. Select DIMMER with the trackball and press the [MENU] key to open the dialog box.



DIALOG BOX FOR SETTING NUMERIC DATA
Select ▲ (raise setting) or ▼ (lower setting) with the trackball and press [MENU] key to change setting. Select QUIT to finish; CANCEL to cancel operation.

Dialog box for setting numeric value

5. Select ▲ (raise setting) or ▼ (lower setting) with the trackball.
6. Press the [MENU] key to change the setting.
7. Select QUIT with the trackball and press the [MENU] key.
8. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

1.6 Display Mode, Display Division

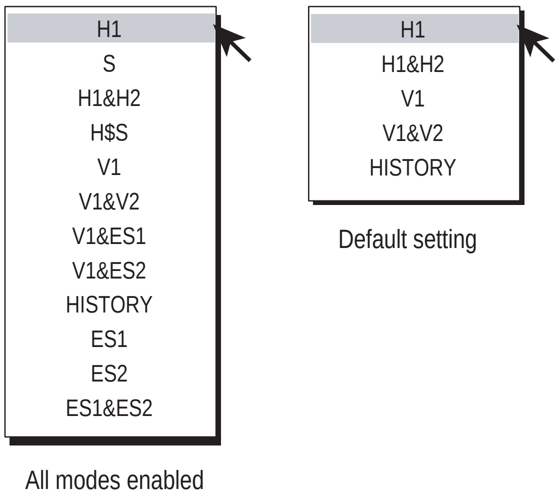
This sonar provides a total of ten display mode selections: Horizontal, Horizontal2, S, S combination, Vertical1, Vertical1, Vertical2, Vertical1 + ES1 (echo sounder), Vertical 1 + ES2 (net recorder), History, ES1, ES2, and ES1 + ES2. The user may preset as many modes as desired and select one with the [MODE] key.

1.6.1 Selecting a display mode

Press the [MODE] key several times until the desired display appears. The default modes are Horizontal, Horizontal1 + Horizontal2, Vertical1, Vertical 1 + Vertical 2, and History. You can program the [MODE] key to show any or all of the modes mentioned above. For further details, see DISPLAY MODE on page 9-2.

Note that the [MODE] key may be programmed to show a pull-down menu instead. For further details, see MODE SELECTION on page 9-2. In this case the procedure for mode selection is as follows:

1. Press the [MODE] key. The following pull-down menu appears.



Mode selection menus

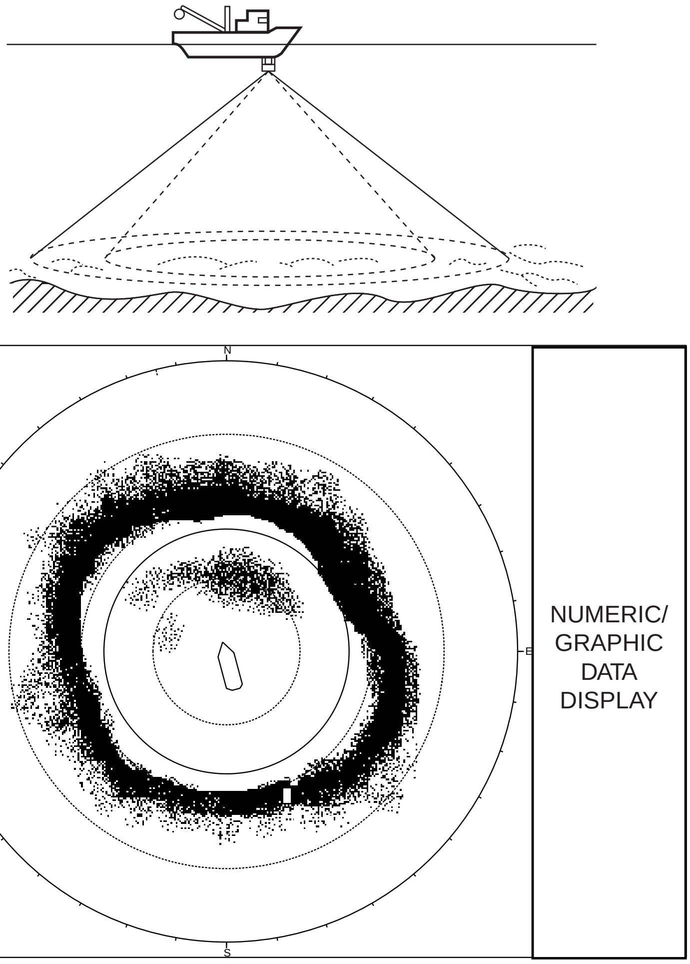
2. Use the trackball to select display mode desired.
3. Press the [MENU] key to display the selected mode.

1.6.2 Sample display mode pictures

Below are typical pictures. For sake of brevity, indications and marks are not shown. For meaning of marks and indications, see respective indications and marks description illustration in applicable chapter.

Horizontal mode

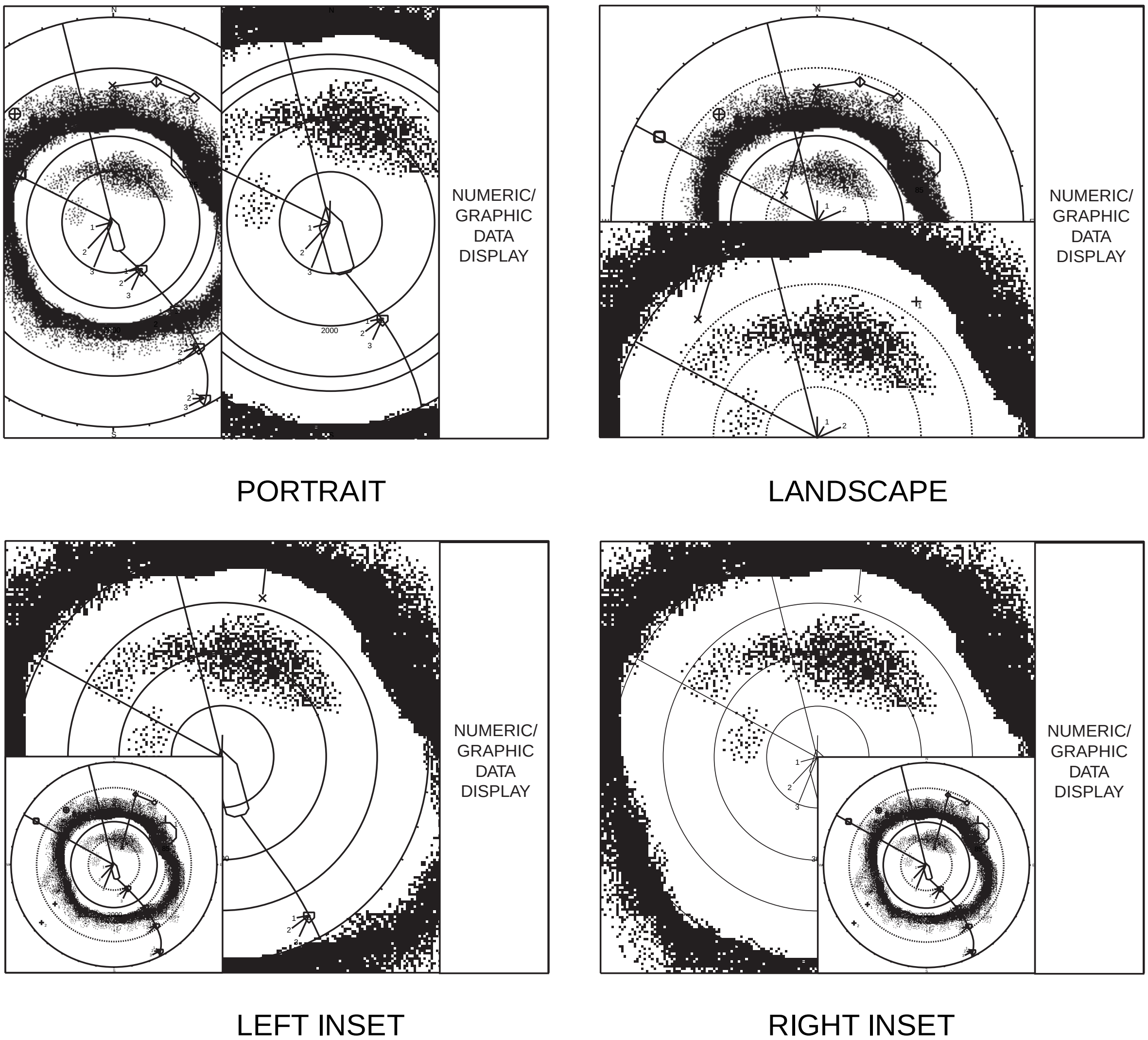
This mode provides 360-degree coverage around the vessel and it is useful for general search. For further details, see Chapter 2.



Horizontal mode display

H2 mode

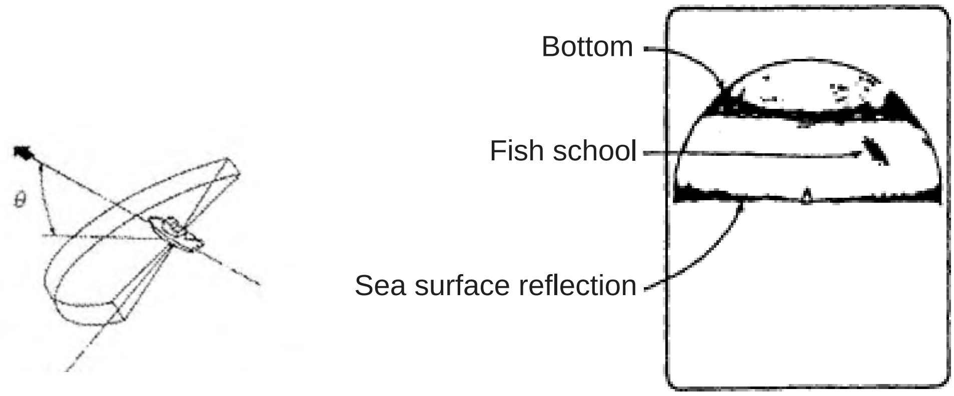
This mode provides two horizontal screens in one of the configurations shown below. The default configuration, LANDSCAPE, shows two horizontal displays up and down. Other configurations available are as shown below. Desired configuration may be chosen with H2 DISPLAY in the DISPLAY SETTING menu. For further details, see Chapter 2.



Horizontal 2 display

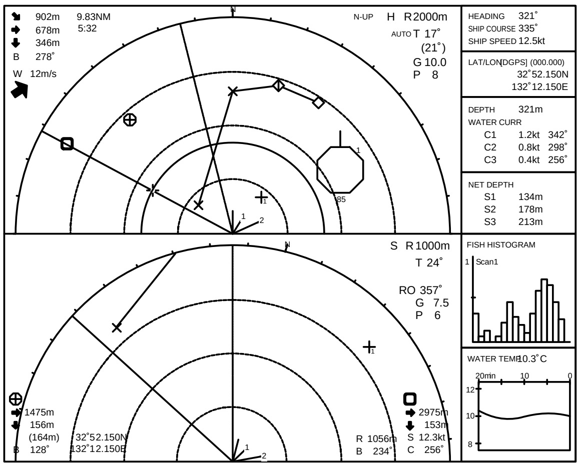
Slant mode, single display

The Slant mode shows a 180-degree cross section, using chosen tilt angle and train setting.

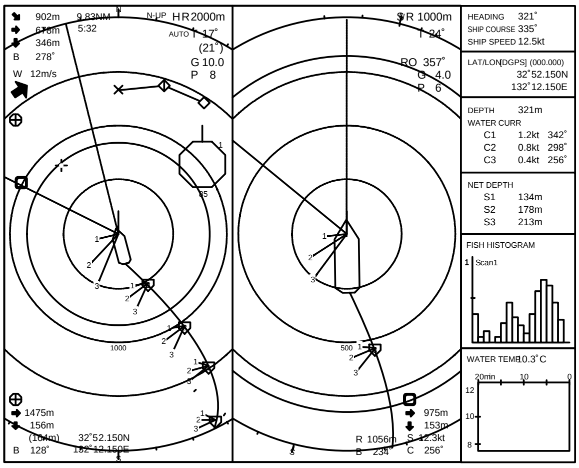


Slant display (single)

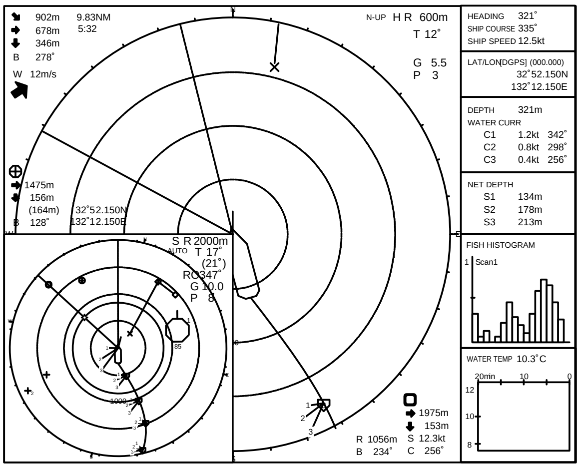
Slant mode, combination display



Landscape display (Slant mode on bottom half)



Portrait display (Slant mode at right half)

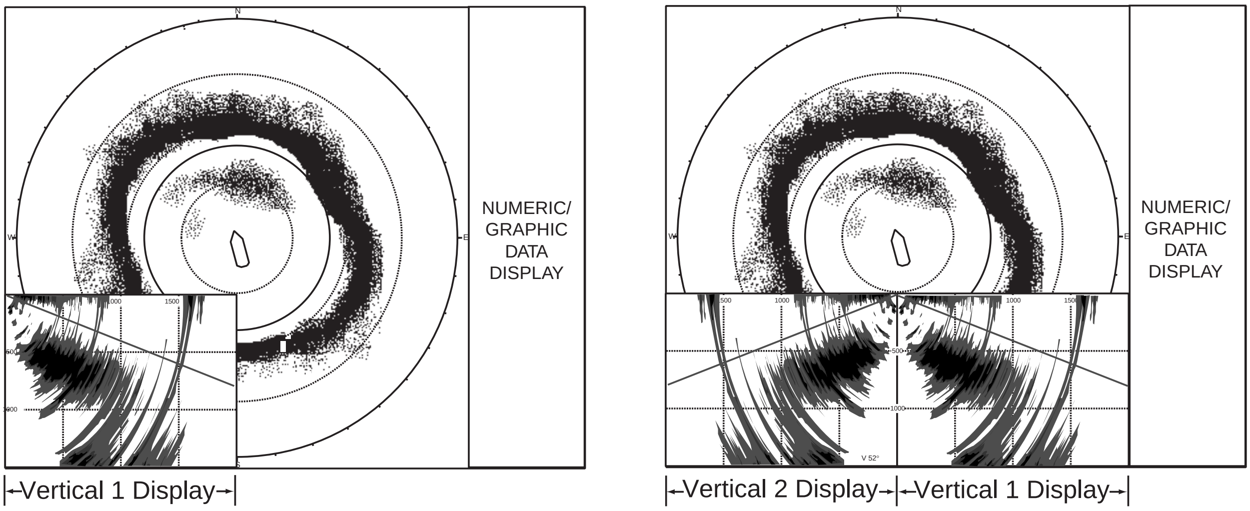


Slant mode in inset

Slant display (combination)

V1 and V2 modes

The V1 and V2 modes show a vertical slice of the bearing selected by the vertical bearing mark on the horizontal display. The vertical 2 mode provides two vertical slices. Chapter 3 discusses the vertical mode.



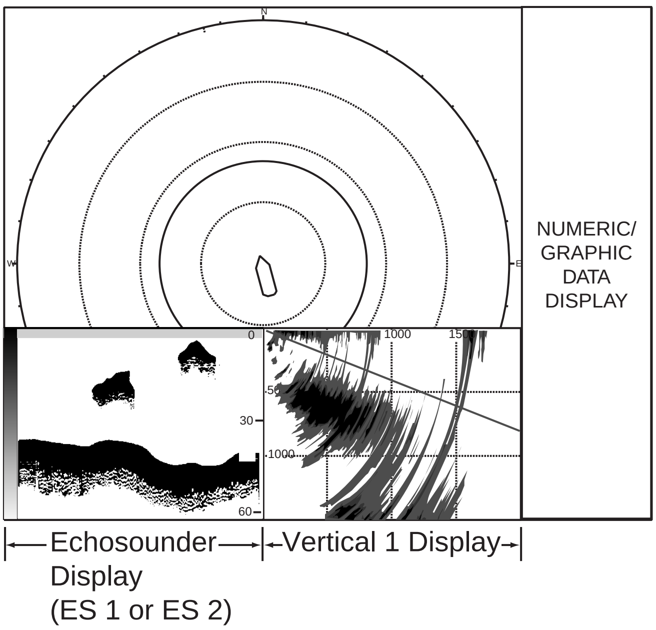
V1 mode

V1 & V2 mode

V1 and V2 displays

V1 + ES1 (or ES2) mode

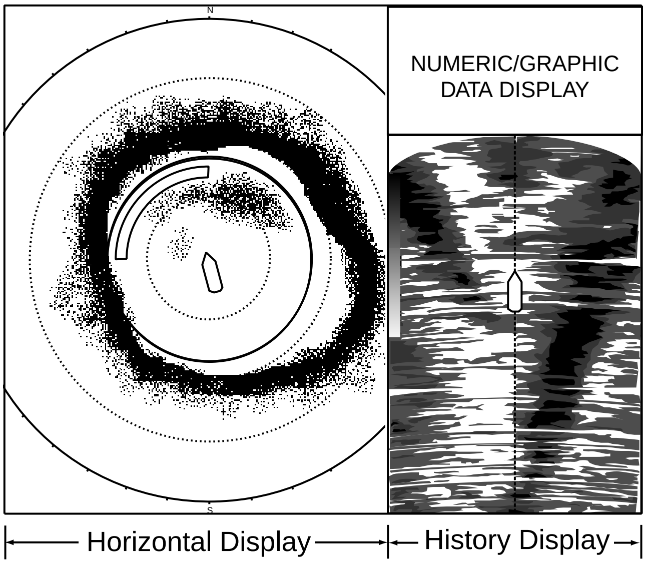
The V1 + ES1 (or ES2) combines the vertical 1 display with the picture from an echo sounder or a net recorder.



V1 & ES1 (ES2) display

History mode

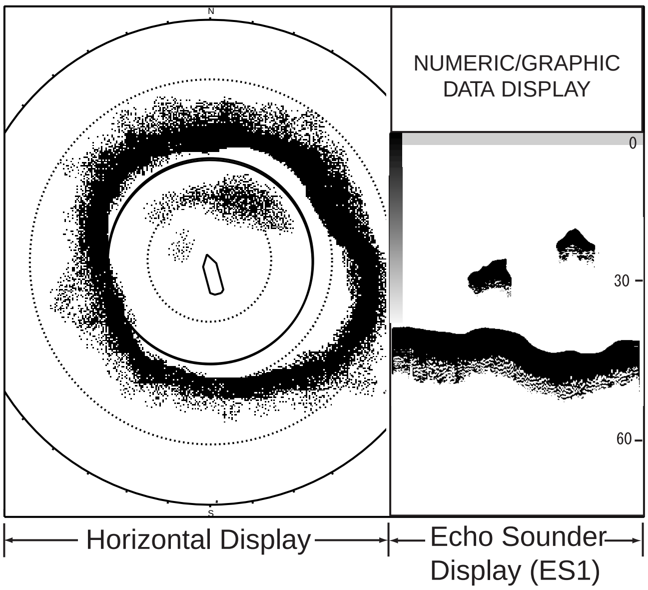
The history mode shows the horizontal and history displays. Echo data for the echoes within the history marker on the horizontal display scroll down the history display in the downward direction – the latest echoes at the top and the oldest at the bottom. This mode is useful for observing fish echoes over time. For further details, see Chapter 6.



History display

ES1 mode

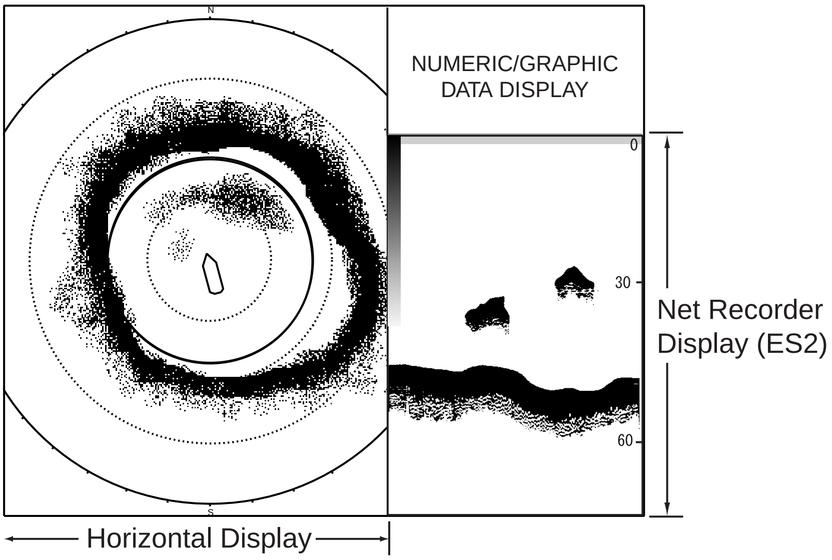
The ES1 mode shows the echo sounder display. For further details, see Chapter 5.



ES1 display

ES2 mode

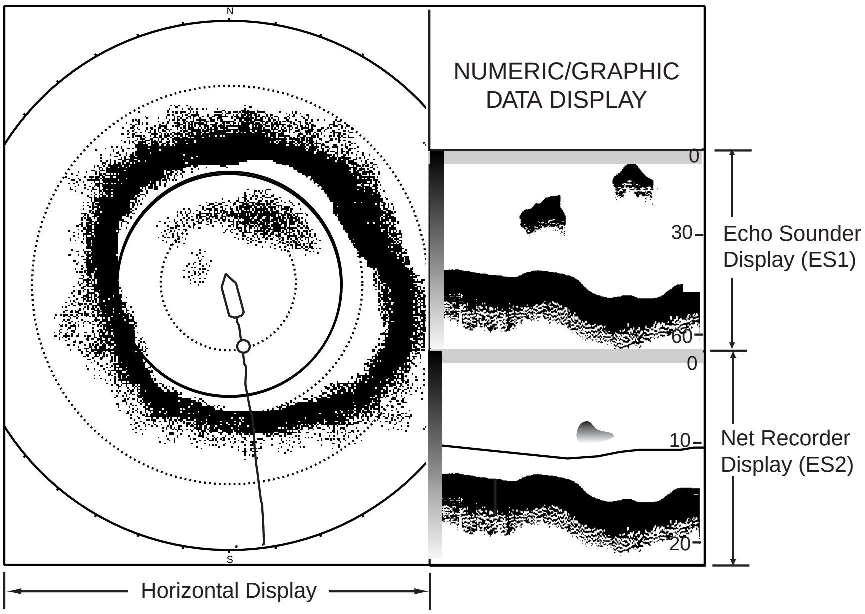
The ES2 mode shows the net recorder display. The net recorder display can show the downward looking picture alone or both the downward and upward looking pictures. Note that this mode can also show the echo sounder picture.



ES2 display (shown: downward picture)

ES1 + ES2 mode

The ES1 + ES2 mode shows the echo sounder and net recorder displays.



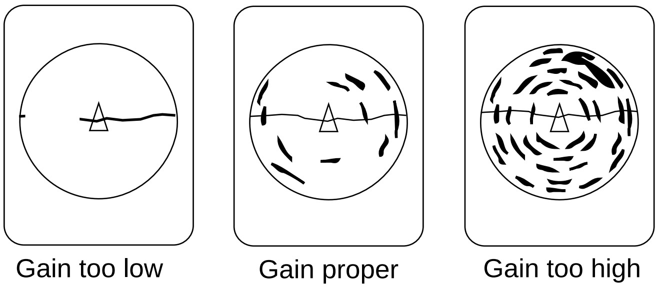
ES1 + ES2 display

1.7 Adjusting the Gain

The [GAIN] control adjusts receiver gain (sensitivity) for the horizontal, slant vertical modes. Adjust it so fish echoes are clearly displayed with minimal noise on the screen. Too high a gain setting not only displays excess noise and makes it difficult to discriminate wanted echoes but also causes bottom echoes to be painted in strong colors, resulting in echoes being masked by bottom reflections. Normally, set the control somewhere between positions 3 and 7.

1. If the horizontal and vertical modes are active, press the [HSV] key to show the range and gain indications of the mode you wish to adjust in yellow. Pressing the [HSV] key changes the range and gain indication in yellow between horizontal1 and horizontal2, or horizontal and vertical, alternately.
2. Adjust the [GAIN] control.

   New gain setting is momentarily displayed in large characters at the top of each display. Gain is always displayed at the top right-hand corner of the horizontal display and bottom on the vertical 1 display.

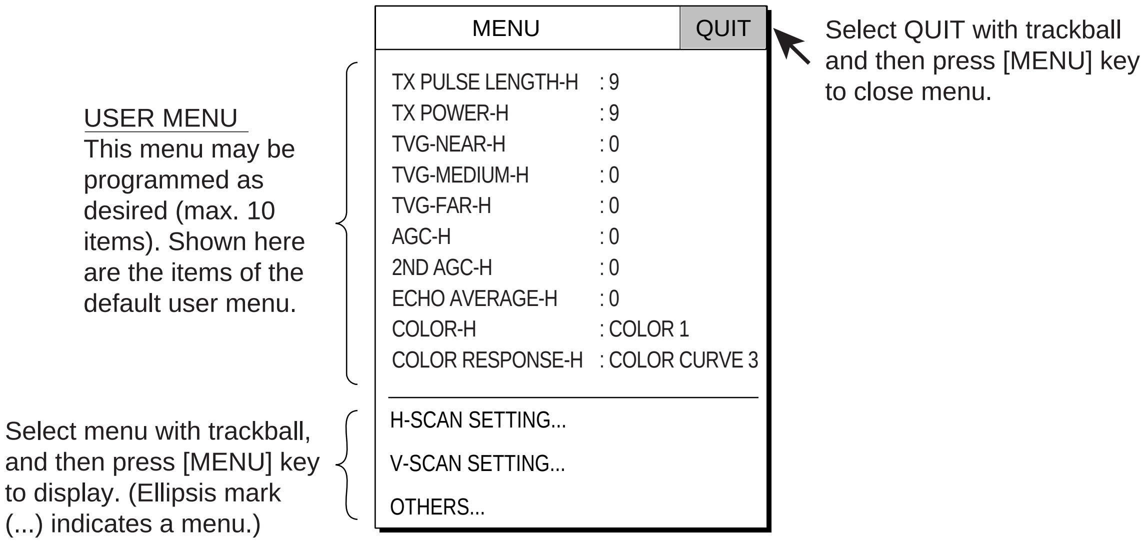


Example of proper and improper gain settings on the horizontal display

1.8 Menu Overview

Most operations are carried out through the menu. This section provides basic menu operating information.

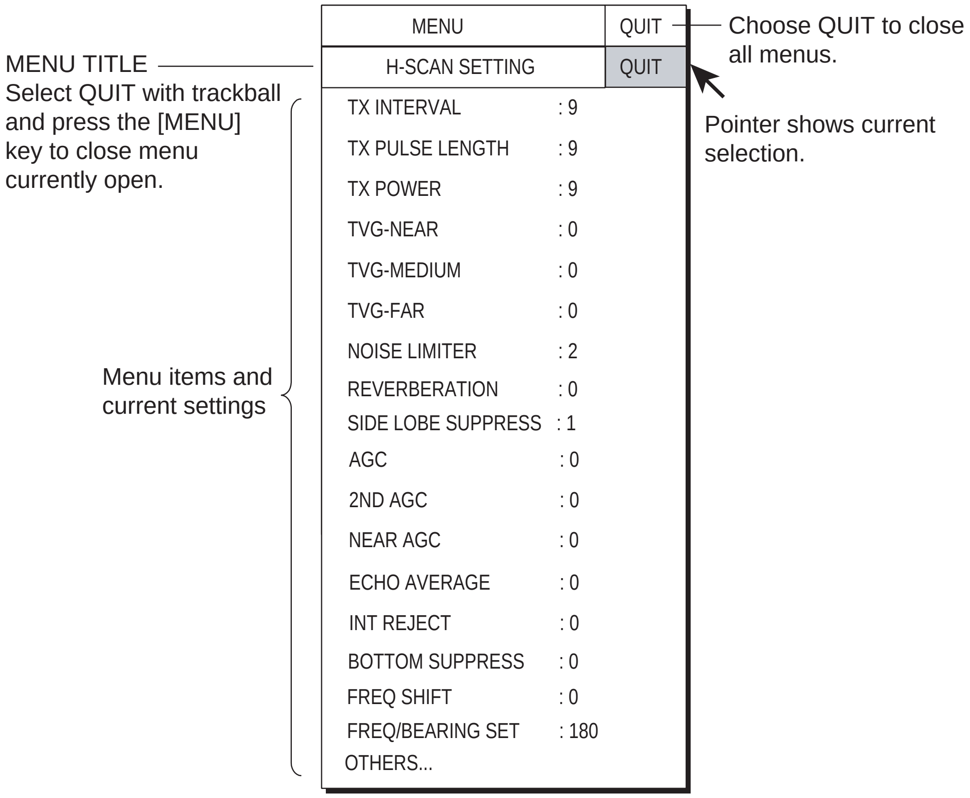
1. Press the [MENU] key to open the main menu.



Main menu

Note: The menus illustrations in this manual show current menu settings with a gray highlight. Actual equipment shows current settings differently.

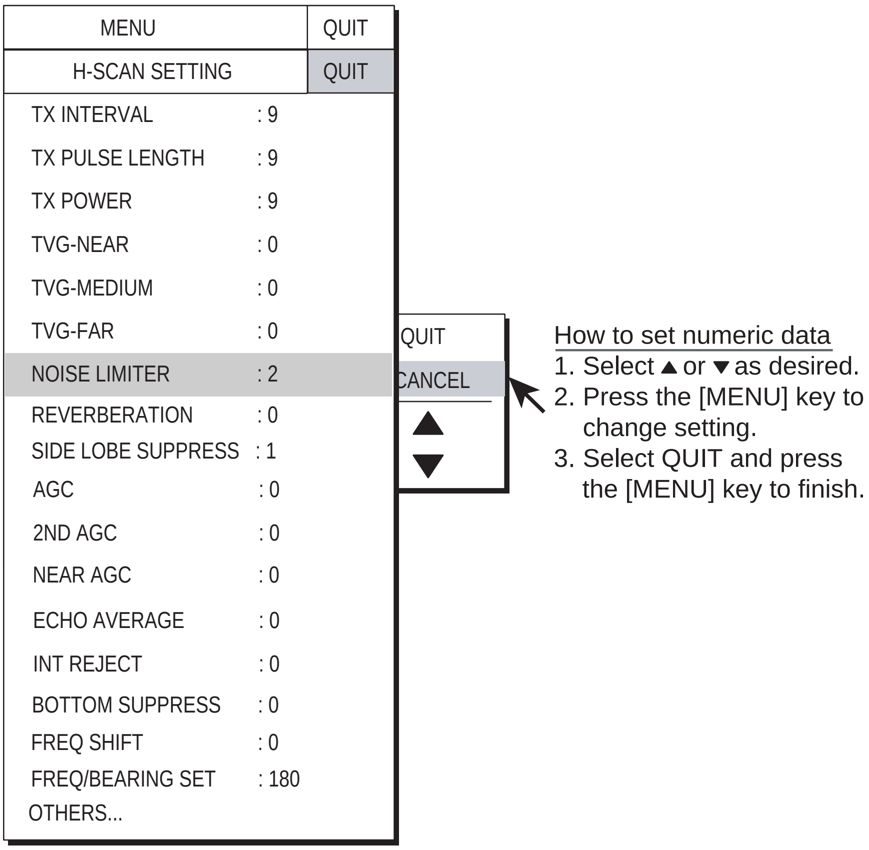
2. Select menu desired with the trackball and press the [MENU] key. (For example, select the H-SCAN SETTING menu.)



H-SCAN SETTING menu

Note: In the S-mode combination display, the [HSV] key functions to switch between H-SCAN SETTING menu and S-SCAN SETTING menu.

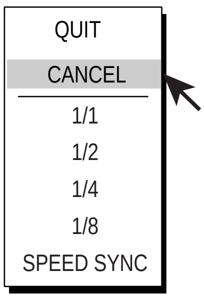
3. Select menu item desired with the trackball and press the [MENU] key. (For example, select NOISE LIMITER.) A dialog box for the corresponding menu item appears.



H-SCAN SETTING menu

4. Select ▲ (raise setting) or ▼ (lower setting) with the trackball and press the [MENU] key to change setting.

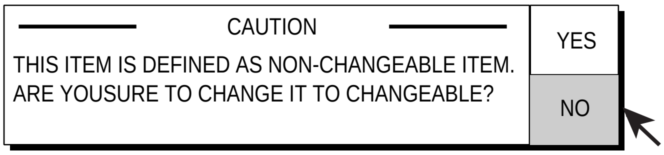
Note: For items having options the arrows in the dialog box are replaced with appropriate options. For example the dialog box for selection of picture advance speed in the echo sounder mode looks as below.



Echo sounder picture advance speed dialog box

5. Use the trackball to select QUIT from the dialog box and press the [MENU] key to close the menu.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: In the default setting, the sub menu item INITIAL SETTING in the OTHERS menu and some items in the INITIALIZATION menu are shown in red. This means their items are locked to prevent accidental change of setting. When you open one of these sub menus and select an item, the message below appears. To change the setting of the selected item, select YES and press the [MENU] key, and the dialog box for the item selected appears. To escape, select NO and press the [MENU] key. You may wish not to show the message below, that is, disable the setting protection feature. For further details, see ITEM ATTRIBUTION on page 9-16.

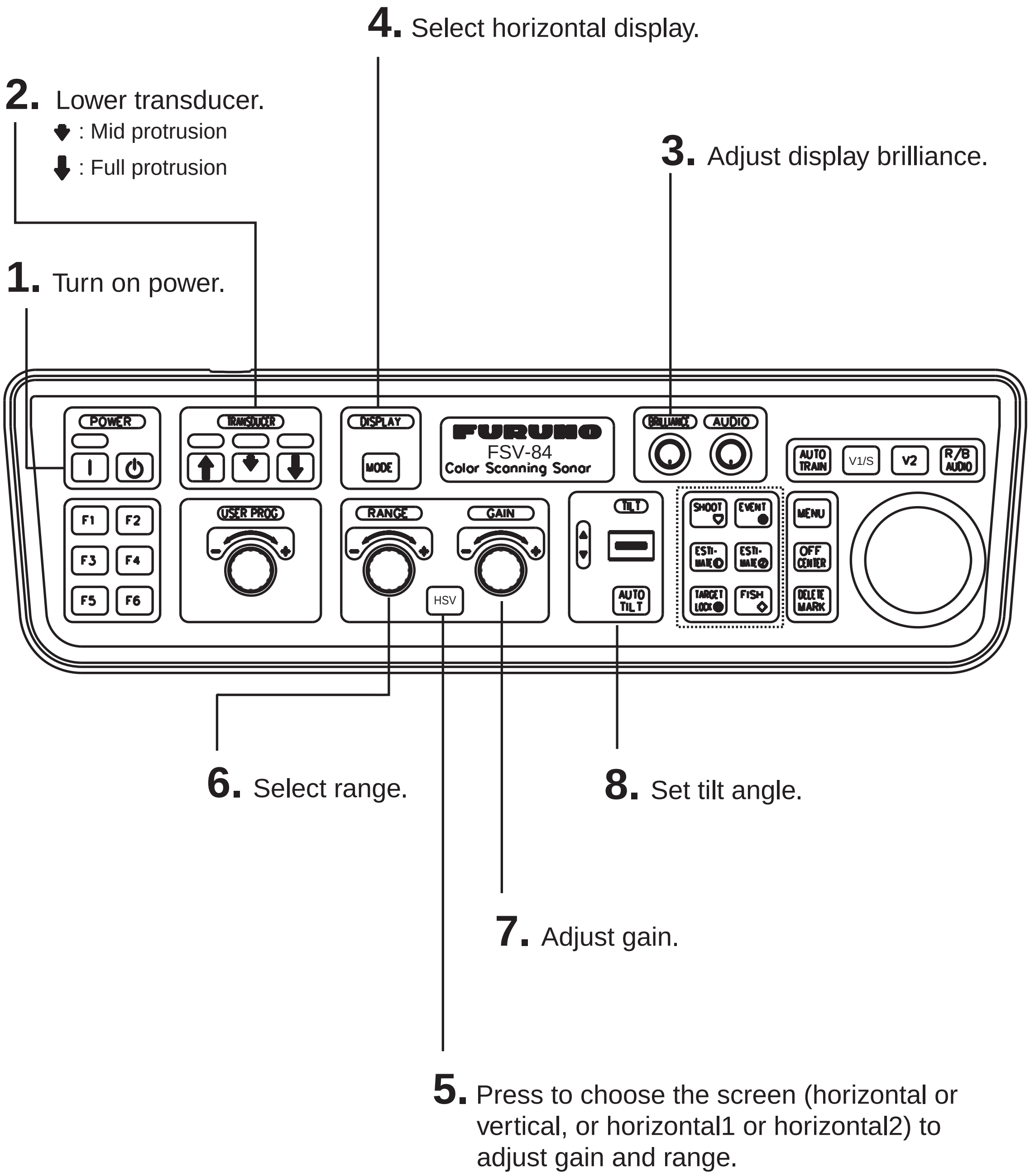


Caution for menu setting change

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2. HORIZONTAL MODE

2.1 Basic Operating Procedure

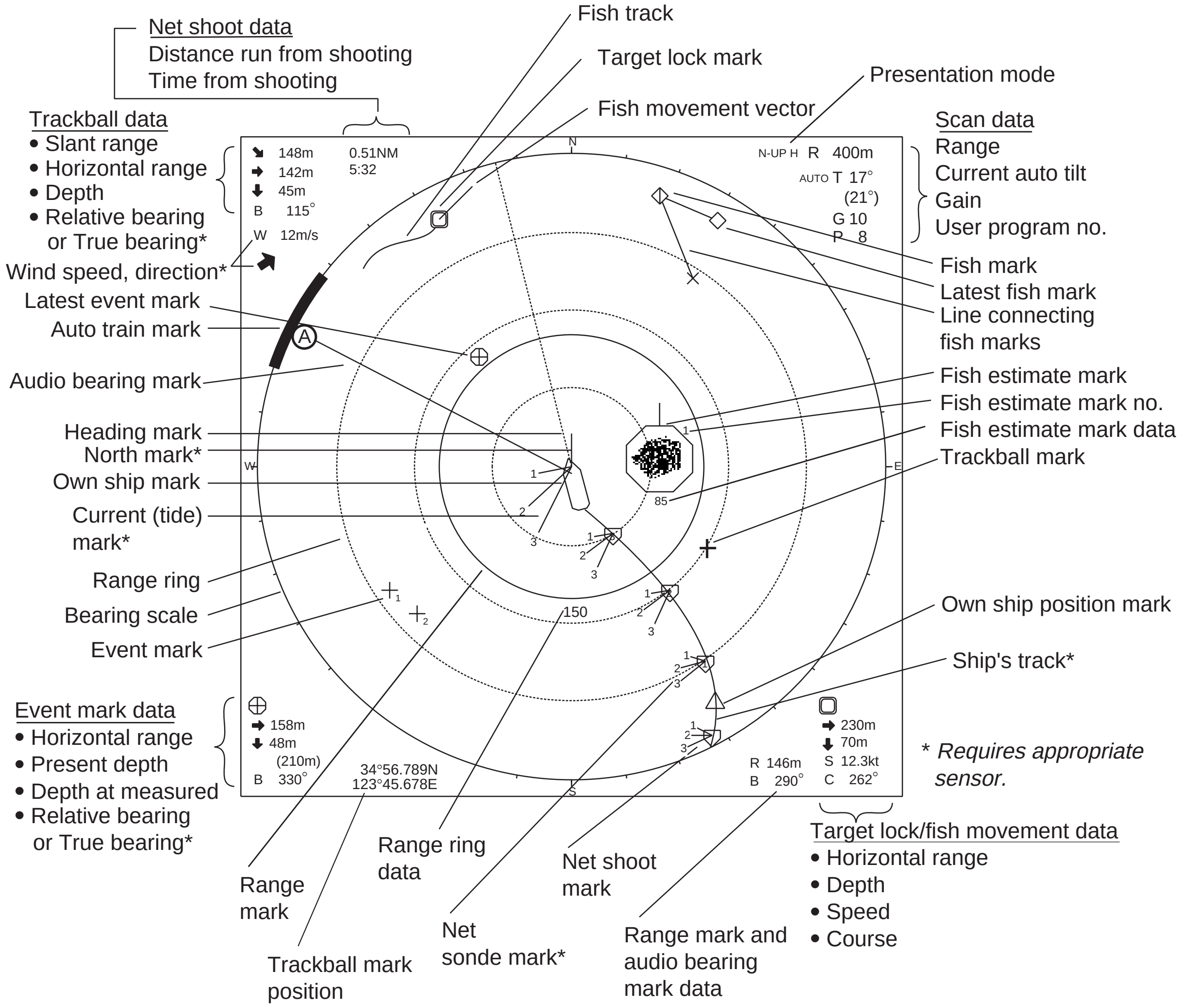


Control unit

2.2 Indications and Marks

2.2.1 Horizontal mode

The horizontal mode provides a 360° picture around the boat. To display the horizontal mode picture, press the [MODE] key.

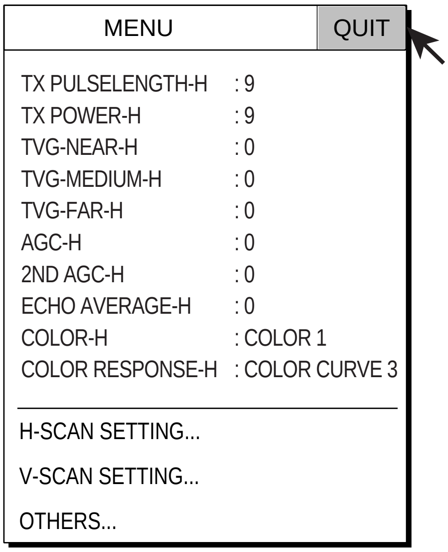


Horizontal mode indications and marks

2.2.2 Horizontal2 mode

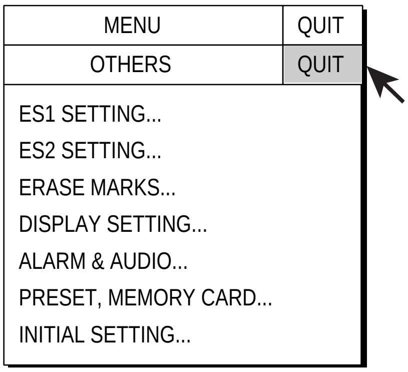
The H2 mode shows one of four kinds of horizontal display combinations: LANDSCAPE, PORTRAIT, RIGHT INSET and LEFT INSET. Follow the procedure below to select a combination display.

1. Press the [MENU] key to open the main menu.



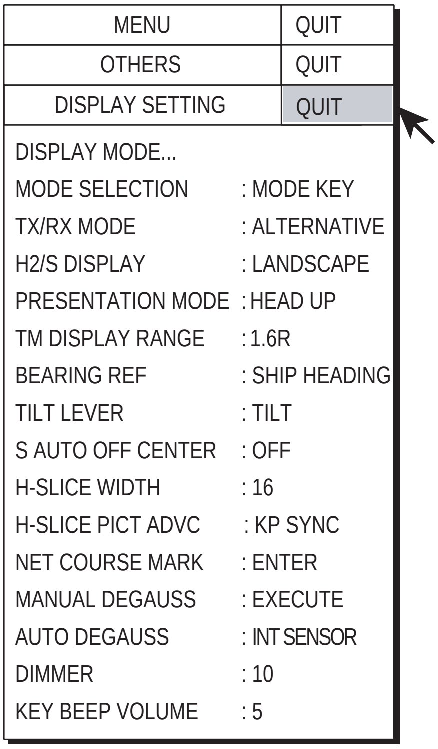
Main Menu

2. Select OTHERS with the trackball and press the [MENU] key to open the OTHERS menu.



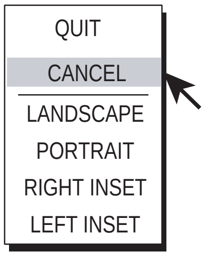
OTHERS menu

3. Select DISPLAY SETTING and press the [MENU] key to open the DISPLAY SETTING menu.



DISPLAY SETTING menu

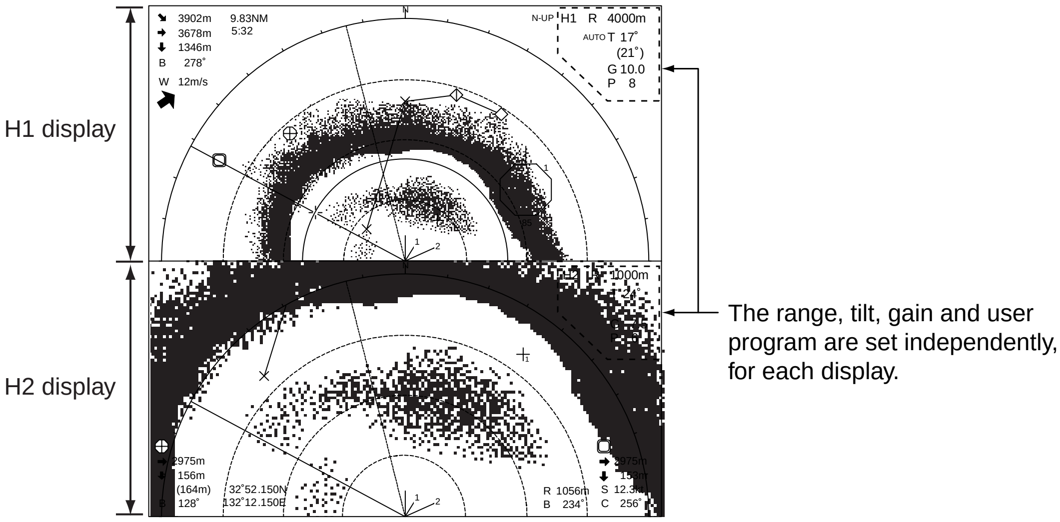
4. Select H2/S DISPLAY and press the [MENU] key.



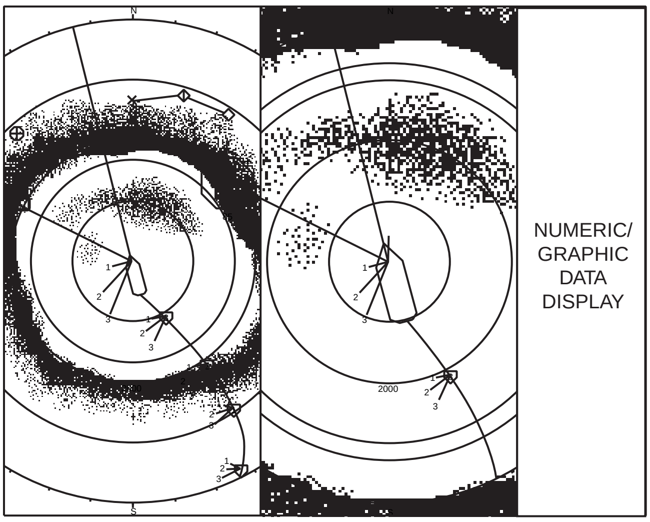
Dialog box for setting combination

5. Select the desired combination with the trackball and press the [MENU] key.
6. Select QUIT and press the [MENU] key to finish.

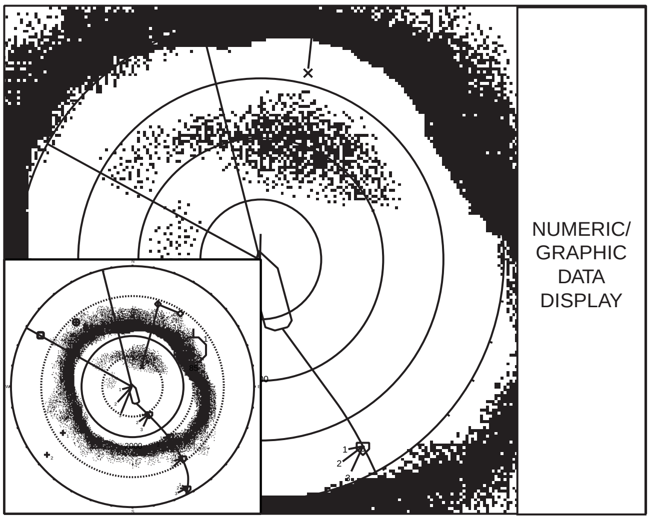
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.



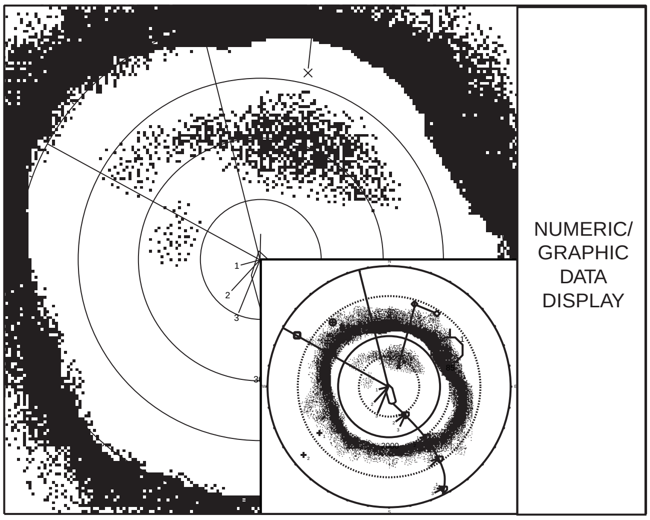
LANDSCAPE



PORTRAIT



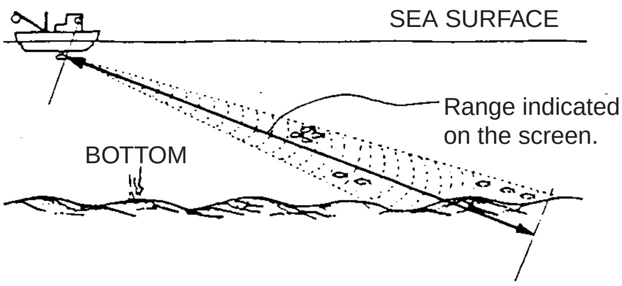
LEFT INSET



RIGHT INSET

2.3 Display Range

The [RANGE] control selects the detection range. The range selected is momentarily displayed in large characters at the top of the screen. Range is always displayed at the top right hand corner of the screen.



Range concept

Below are the default ranges (in meters).

Range Setting	1	2	3	4	5	6
Range	100	200	400	600	800	1000

1. If the two horizontal displays, slant display or the horizontal and vertical displays are active, press the [HSV] key to show the range and gain indications of the horizontal mode in yellow. (This step is not necessary when only the horizontal mode is active.) Range and gain indications are shown in white on other modes
2. Operate the [RANGE] control to select desired range.

Note: Ranges may be preset as desired on the PRESET, MEMORY CARD menu. For further details, see H/S-SCAN RANGE on page 9-5.

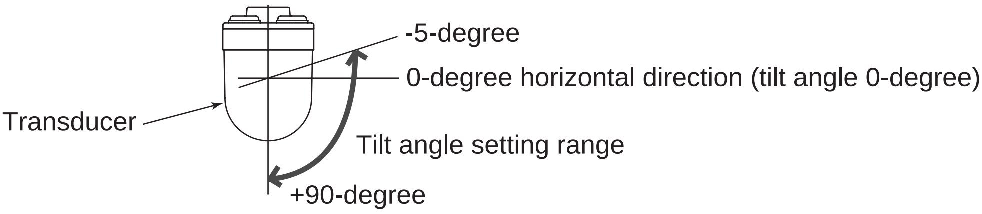
2.4 Tilt Angle

The tilt angle shows the direction to which the sound wave is emitted. When the sound wave is emitted horizontally, the tilt angle is said to be 0° and when vertically, 90°. The tilt angle can be set between –5°(upward) to 90° (downward), in increments of 1°. The tilt angles for horizontal 1 and horizontal 2 modes can be set independently of one another.

2.4.1 Setting the tilt angle

To manually set a tilt angle, operate the [TILT] control. Watch the tilt angle indication and tilt angle indicator at the top right corner of the screen.

Select tilt angle depending on target fish. For surface fish select a shallow angle (about 5°) and for bottom fish, a deep angle.



Note: The [TILT] control functions as a bearing setting lever in the following conditions:

- TILT LEVER in the DISPLAY SETTING menu is set to “TILT & V1.”
- The vertical display is chosen in the vertical mode.

2.4.2 Automatic tilt

The [AUTO TILT] key automatically scans the tilt angle within the selected width. This is useful when you want to find the center depth of a fish school.

1. Press the [AUTO TILT] key to select auto tilt angle desired. Each time the [AUTO TILT] key is pressed the auto tilt angle changes in the following sequence.

   OFF → [±1 - 4°] → [±2 - 6°] → [±3 - 8°] (Narrow)

   OFF → [±2 - 10°] → [±4 - 16°] → [±6 - 20°] (Wide)

Automatic tilt range (narrow) with AUTO TILT key

Range	Width (1)	Width (2)	Width (3)	Period
60, 100	±4°*	±6°*	±8°*	Period: One trans.
150, 200	±2°	±4°*	±6°*	Tilt angle changes
300, 400	±1°	±2°	±4°*	in 2° increments for
500, 600	As above	As above	±3°	asterisk-marked
700, 800	As above	As above	As above	width;
900, 1000	As above	As above	As above	1° increments for
1100 and more	As above	As above	As above	all other widths.

Automatic tilt range (wide) with AUTO TILT key

Range	Width (1)	Width (2)	Width (3)	Period
60, 100	±10°	±16°	±20°*	Period: One trans.
150, 200	As above	As above	As above	Period: Four trans.
300, 400	As above	As above	As above	Period: Two trans.
500, 600	±8°	As above	As above	Same as above
700, 800	±6°	±12°	±16°	Same as above
900, 1000	±4°	±8°	±12°	Same as above
1100 and more	±2°	±4°	±6°	Same as above

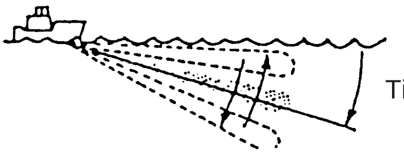
   * For combination modes H1/H2, H1/V, H1/S, two transmissions/period at depth between 60 and 200 m and one transmission/period for range 300 m or greater.

   Note: Wide tilt angle is activated from the SYSTEM menu. For further details, contact your dealer.

2. Auto tilt begins, with the tilt angle set with the [TILT] control as the center tilt angle.
3. If necessary, change center tilt angle with the [TILT] control.

For example, when the [RANGE] control, [TILT] control and [AUTO TILT] key are set to 800 m, 8° and width (1) respectively, the tilt angle changes at each transmission as follows:

8°→9°→8°→7°→8°



Auto tilt concept

Note: The [AUTO TILT] key is inoperative when the target lock function is active or is made active. Auto tilt is resumed once target lock is disabled.

2.4.3 Relation between bottom echo and tilt angle

The figure at the top of the next page illustrates how two fish schools “a” and “b” are displayed on the screen using three different tilt angles.

Case 1: Tilt angle 30° to 40°

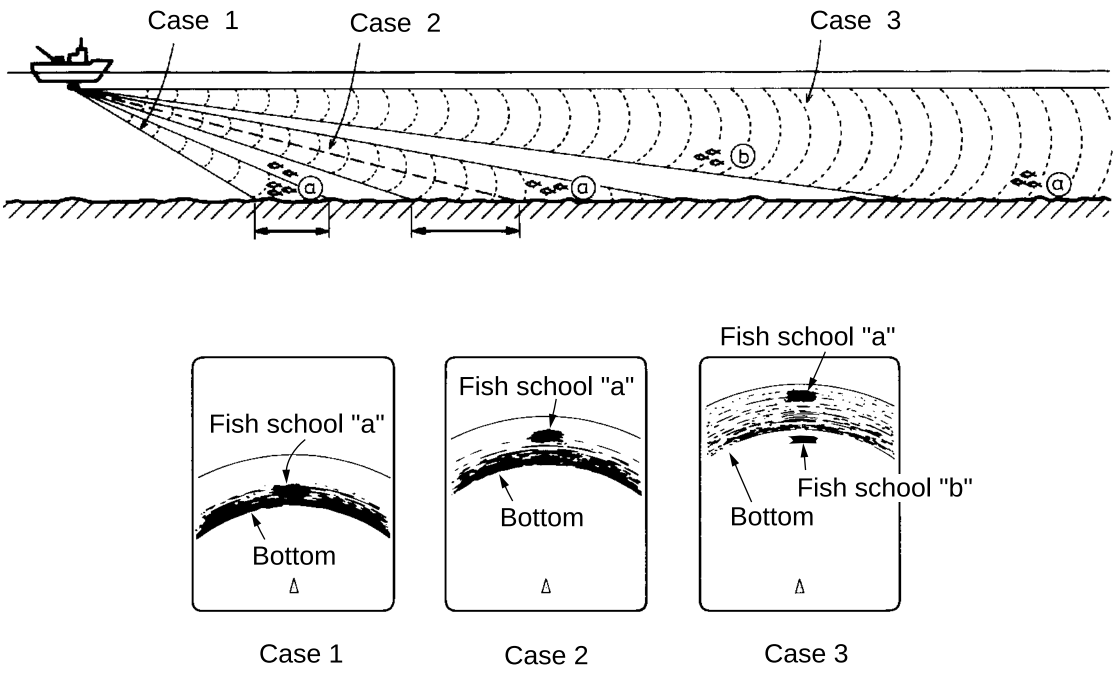
This tilt angle will display the entire bottom since it is captured by the full width of the beam. Fish school is obscured by the bottom.

Case 2: Tilt angle 10° to 20°

This tilt angle will only display half the bottom since it is captured by only the lower half of the beam. Fish school is located above the bottom.

Case 3: Tilt angle 0° to 5°

This tilt angle may or may not capture the bottom since the returning echo is weak. Fish school is located close to the bottom.



Fish echo and tilt angle

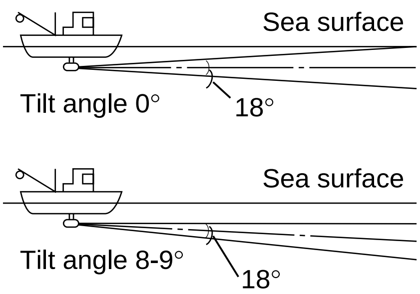
Points to consider

- Normally, a vertically distributed fish school is a better sonar target than the bottom, because it reflects the transmitted pulse back toward the transducer.
- In case 3, both fish schools “a” and “b” are presented. Generally speaking, however, midwater fish schools tend to be larger than bottom fish schools and they are often displayed near the bottom on the display.
- It is difficult to detect bottom fish when they are not distributed vertically.

2.4.4 Tilt angle for surface fish

Sound emitted from the sonar transducer forms an oval-shaped beam with a width of approximately 18° in the vertical direction (vertical beam width at -6dB). The tilt angle is indicated by the angle between the centerline of the beam and the horizontal plane. Then, if the tilt angle is set to 0°, the centerline is parallel with the sea surface and one half of the emitted sound goes upward, toward the sea surface.

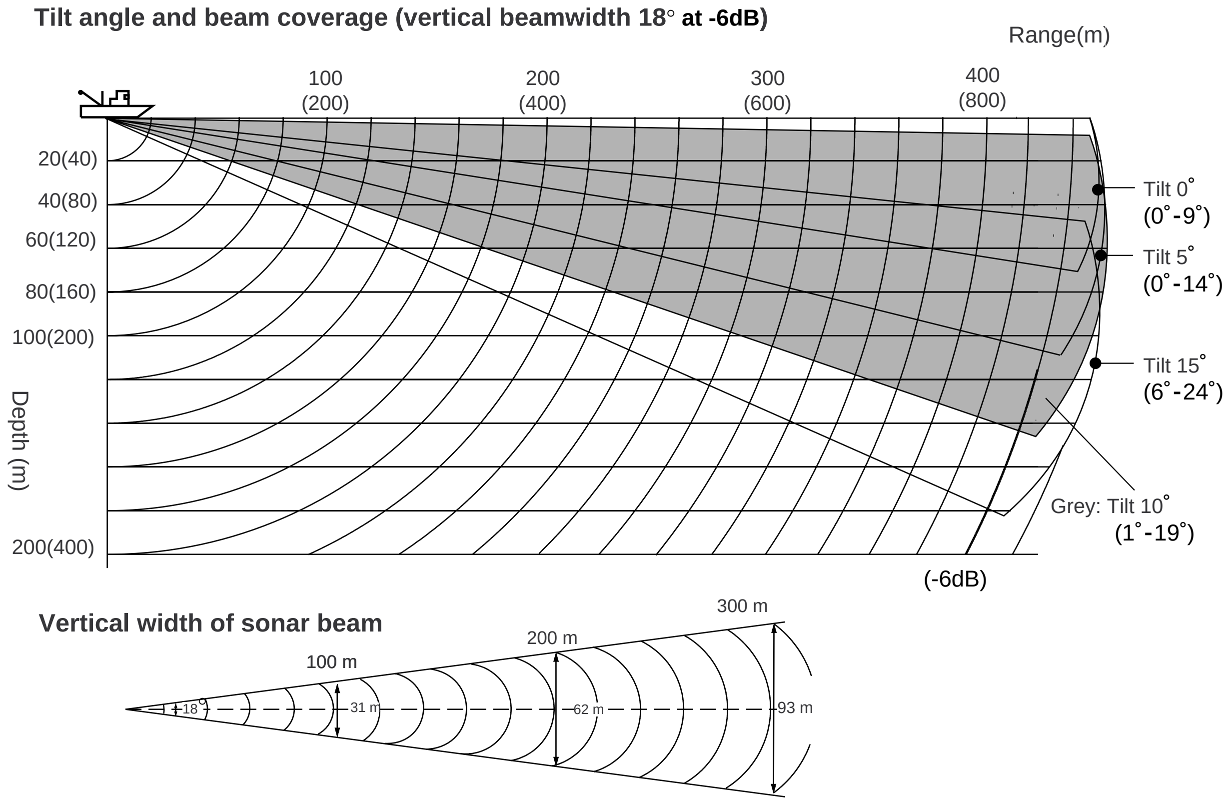
This causes one half of the emitted sound to be reflected toward the transducer and displayed on the screen as sea surface reflections. When the sea is calm, since the sound is reflected just like a light hitting a mirror at a low incident angle, it propagates away and the sea surface reflections become negligible.
However if the sea is not calm enough, they will become dominant and interfere with observation of wanted echoes. To minimize these sea surface reflections and to search surface fish schools effectively, the tilt angle is usually set between 8° and 9° so the upper portion of the beam becomes almost parallel with the sea surface. When the sea is rough, the tilt angle is slightly increased to lessen the affect of sea surface reflections.



Tilt angle

2.4.5 Suitable tilt angle

The figure below illustrates the relationship among tilt angle, depth and detection range. Refer to it to find out the suitable tilt angle for a given depth/detection range.

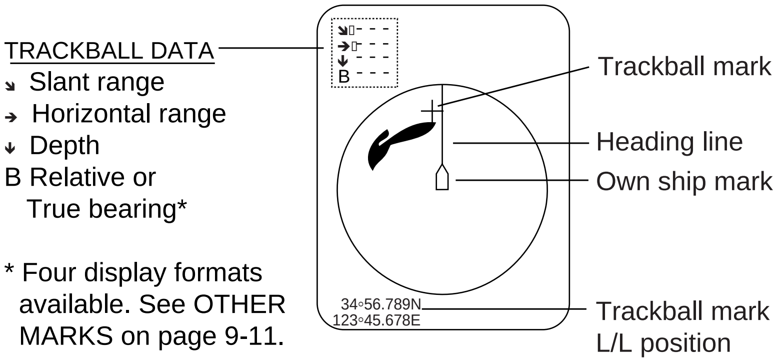


Tilt angle and beam coverage

2.5 Measuring Range and Bearing to a Target

Operate the trackball to place the trackball mark on the target you want to measure the range and bearing. The range, bearing and depth to the target appear at the upper left corner of the screen.

Trackball position may also be show in latitude and longitude. For further details, see CURSOR POSITION on page 9-11.

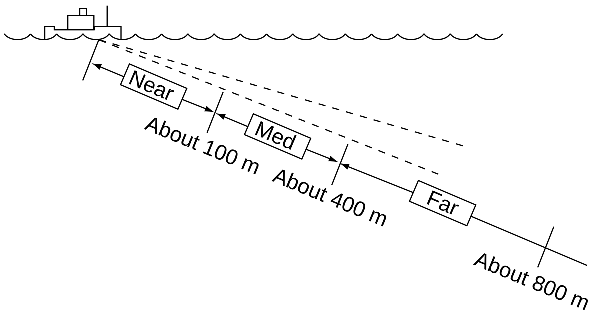


Location of trackball data

2.6 Eliminating Weak Echoes

Echoes from targets such as bottom and fish return to the transducer in order of distance to them, and when we compare their intensities at the transducer face, those from nearer targets are generally stronger when their reflecting properties are nearly equal. The sonar operator will be quite inconvenienced if these echoes are directly displayed on the screen, since he cannot judge the actual size of the target from the size of echoes displayed on the screen. To overcome this inconvenience, use the TVG function. It compensates for propagation loss of sound in water; amplification of echoes on short range is suppressed and gradually increased as range increases so that similar targets are displayed in the similar intensities irrespective of the ranges to them.

The FSV-84 has three TVG functions, NEAR, MEDIUM and FAR, and they mainly compensate for propagation loss on short, middle and long ranges respectively, centered at the ranges shown below. The higher the TVG setting the greater the amplification of echoes.

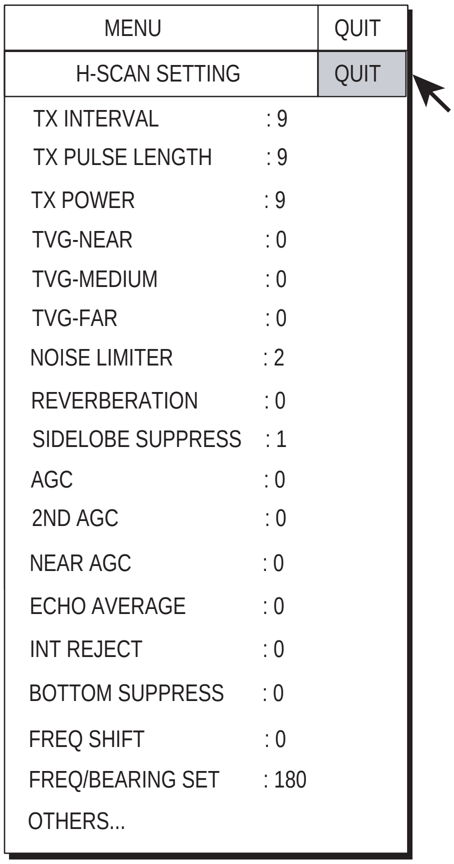


Note: TVG distances can be adjusted from the menu. See page 2-48.

Principle of TVG

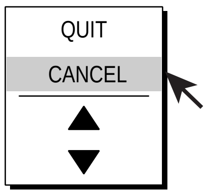
The TVG is also used to suppress unwanted echoes and noise which appear in a certain range area on the screen such as sea surface reflections and cruising noise. To set TVG properly, do the following:

1. Press the [MENU] key to open the main menu.
2. Select H-SCAN SETTING with the trackball and press the [MENU] key to open the H-SCAN SETTING menu.



H-SCAN SETTING menu

3. Select TVG-NEAR with the trackball and press the [MENU] key to show the dialog box.



Numeric data entry dialog box

4. Use the trackball to select ▲ or ▼ and press the [MENU] key to set. The setting range is –5 to 5. The higher the setting the greater the TVG effect.
5. Select QUIT and press the [MENU] key.
6. Repeat steps 3-5 to set TVG-MEDIUM and TVG-FAR.
   When sea surface reflections or plankton layers disturb the picture, decrease appropriate TVG option by one or two steps.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: When a fish school is located on a long-range setting (about 800 meters) and is approaching own ship do as follows:

Adjust the tilt to keep the fish school in the center of the sonar beam, namely, fish school is displayed in strongest colors possible. Confirm that the fish echo is displayed in the same color as it approaches. If the color suddenly changes to weaker colors as the fish enters MEDIUM and NEAR areas, the TVG is improperly set. Adjust the TVG. If this again produces sea surface reflections and noise try to remove them with the AGC and noise limiter.

If the above procedure does not produce satisfactory results, the TVG curve can be changed on the OTHERS sub menu in the H-SCAN SETTING menu. Also, adjust the setting of NEAR AGC, referring to next section.

2.7 Suppressing Bottom Tail

2.7.1 Adjust AGC

The AGC functions to automatically reduce the receiver gain only against strong echoes such as the bottom or a large fish school. Since weak echoes remain unaffected, a small fish school becomes easier to detect. Adjust it so that the AGC works only on bottom reflections. Do not set it too high; weak echoes may be missed.

1. Press the [MENU] key to open the menu.
2. Select H-SCAN SETTING menu and press the [MENU] key.
3. Select AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.7.2 Decrease pulse length

The pulse length determines the length of the transmission pulse emitted into the water. While a longer pulse is advantageous for long-range sounding, it has the disadvantage of being poor in discrimination of targets, that is, the ability to separate several closely located targets. When searching bottom fish, therefore, it is useful to shorten the pulse length in order to separate fish echoes from bottom reflections. Decrease the pulse length setting to shorten the pulse length. For search of surface and midwater fish in which bottom reflections are not so strong, use the longest pulse length “9”.

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select TX PULSE LENGTH and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the longer the pulse length.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.7.3 Adjust 2nd AGC

While it is ideal to suppress bottom echoes with the AGC alone there are some fishing grounds where this is not possible. (The high power sonar has the advantage of long-range detection but this can also be a disadvantage, since weaker echoes may be hidden in strong, unwanted echoes such as the bottom.) If you cannot suppress bottom echoes or sea surface reflections by the AGC function alone, use the 2nd AGC feature. Normally a setting of 1 or 2 is suitable. For especially strong echoes, use a setting of 3 or 4.

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select 2nd AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-12. The higher the setting the greater the suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.7.4 Adjust Near AGC

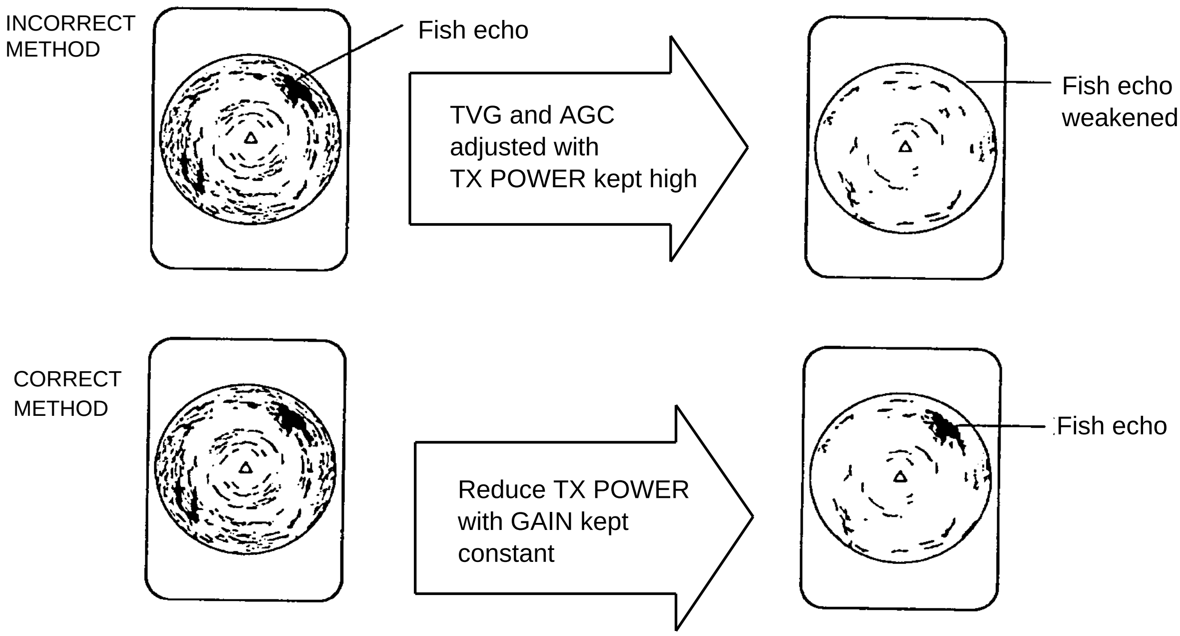
When an excessively strong echo is received in shallow or heavily sedimented waters, you may not be able to suppress it by the TVG control alone. In this case, a fish school which is displayed at more than 300 m away may disappear gradually when the ship is approaching the fish school.

Use the Near TVG feature to suppress this strong echo. Normally set it between 3 and 4, however, this setting depends on the sea area. Do not set it too high; all echoes (including noise) from near distance may be painted in red.

1. Press the [MENU] key to open the menu.
2. Select H-SCAN SETTING menu and press the [MENU] key.
3. Select NEAR AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-10. The higher the setting the greater the echo level of near distance.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.8 Suppressing Bottom and Sea Surface Reflections in Shallow Waters

In shallow fishing grounds with hard or rocky bottom, bottom reflections often interfere with wanted fish echoes and they can not be eliminated sufficiently with the aforementioned TVG and AGC functions, especially when the TILT is set to a larger angle in order to track fish schools approaching within 400 m. In such cases try to reduce the output power by adjusting the Tx output instead of turning down the gain. The picture becomes clearer when output power is reduced rather than when the GAIN is decreased as illustrated below.



How to suppress bottom and sea surface reflections in shallow waters

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select TX POWER and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the higher the Tx power.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.9 Rejecting Sonar Interference and Noise

While observing the sonar picture, you may encounter occasional or intermittent noise and interference. These are mostly caused by on-board electronic equipment, engine or propeller noise, or electrical noise from other sonars being operated nearby.

2.9.1 Identifying noise source

To eliminate noise effectively, you should first identify the noise source as follows:

1. Stop transmission on the TEST menu, by turning ON “TX” in the TEST menu, and turn on the power of all on-board equipment one by one while observing the picture. If noise appears on the sonar display, that equipment is emitting noise. Check the offending equipment’s ground and installation.
2. Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above two steps has effect on the picture, adjust one of the following:

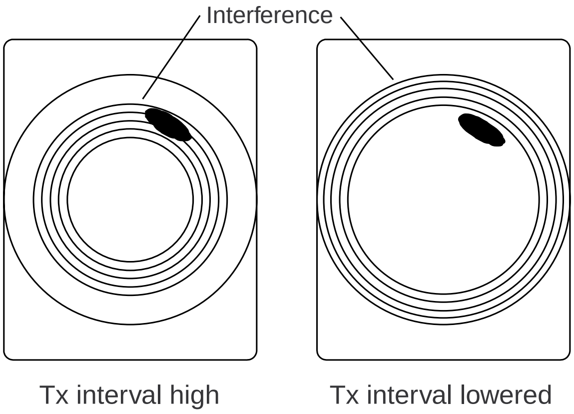
2.9.2 Interference rejector

This control is similar to the interference rejector on echo sounders and radars. It is effective for rejecting random noise and sea surface reflections in rough sea conditions. Set it so that noise is just eliminated. Do not use an unnecessarily high setting since it may also reject small wanted echoes.

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select INT REJECT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-3. The higher the setting the greater the degree of interference rejection.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.9.3 Changing Tx interval

When other sonars nearby are operating the same transmission interval as that of own ship's sonar, an interference ring appears on the display. To erase the interference ring from the screen, reduce the TX INTERVAL on the H-SCAN SETTING menu.



How TX INTERVAL works

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select TX INTERVAL and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the longer the Tx interval. The setting 0 is same as the setting 9.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: When the sonar is used in shallow water with the range set between 60 m and 200 m and Tx cycle at “9”, bottom reflections caused by the 2nd-to-the-last transmission may appear on near ranges. Lower the Tx interval by 2 or 3 steps to suppress them.

2.9.4 Shifting Tx frequency

If interference cannot be suppressed by the interference rejector or Tx interval, shift the Tx frequency with FREQ SHIFT on the H-SCAN SETTING menu.

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key.
3. Select FREQ SHIFT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is -65 to +65.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.9.5 Noise limiter

Weak, unwanted reflections, colored light-blue or green, appear when the water is dirty, plankton layers exists, or due to ship's noise. The noise limiter can reduce the effects of these unwanted reflections. Raising the setting causes unwanted reflections to be displayed in colors of blue to background color. Normally a setting of 3 or 4 is sufficient.

1. Press the [MENU] key to open the menu.
2. Select the H-SCAN SETTING menu and press the [MENU] key
3. Select NOISE LIMITER and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-15. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.9.6 Echo average

Adjusts echo afterglow, which can be useful for watching echo movement in the H-SCAN SETTING menu. The setting range is 0-7. The higher the number the longer echoes remain on the screen.

2.9.7 Reverberation reduction

You may choose the length of reverberation for the echo signal in the H-SCAN SETTING menu. The larger the value the shorter the reverberation, which makes it easer to see the echo signal. The setting range is 0-3.

2.9.8 Setting reference bearing for frequency change

The FREQ/BEARING SET function in the H-SCAN SETTING menu is provided for avoiding interference from other equipment.

If noise (interference) appears at a specific bearing, change the value of the FREQ/BEARING SET in the H-SCAN SETTING menu. The setting range is 0° to 358°.

Note: The FREQ/BEARING SET function is active only when the SIDELOBE SUPPRESSION on the SYSTEM MENU is set to 1 or 2. For details, contact a FURUNO agent or dealer.

2.9.9 Suppressing gain of bottom echo

None-moving echoes such as bottom echo, plankton echo, etc., may be suppressed by the setting of BOTTOM SUPPRESS in the H-SCAN SETTING menu (moving echoes such as fish school are not effected by this setting). The setting range is 0 to 10. The greater the setting, the greater the suppression level of the bottom, etc.

Note: Avoid using too high a setting - slow-moving fish school may be suppressed as well.

2.9.10 Sidelobe suppression

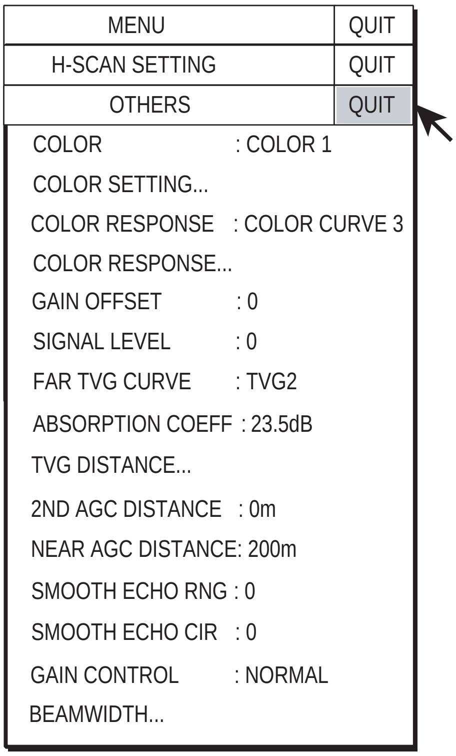
Sidelobes are fairly emissions generated outside the main beam. The energy of the sidelobe is fairly weak but when the water is comparatively shallow and the bottom is rocky and hard, strong signals are detected by the sidelobe.

To reduce the effect of sidelobes, adjust SIDELOBE SUPPRESS from the H-SCAN SETTING menu. The setting range is –3 to +3 and the default setting is 0. The higher the setting the greater the sidelobe suppression. If there is a difference between the port and starboard side images, use a minus setting.

2.10 Adjusting Beamwidth

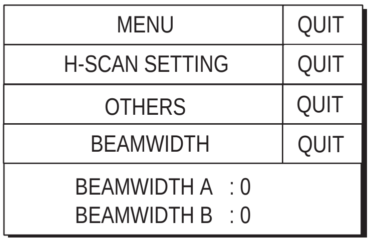
The horizontal beamwidth of the Rx beam can be adjusted at the OTHERS menu as below to raise the horizontal resolution.

1. Press the [MENU] key to open the menu.
2. Select H-SCAN SETTING and press the [MENU] key.
3. Select OTHERS and press the [MENU] key.



.OTHERS menu

4. Select BEAMWIDTH and press the [MENU] key to open the dialog box.



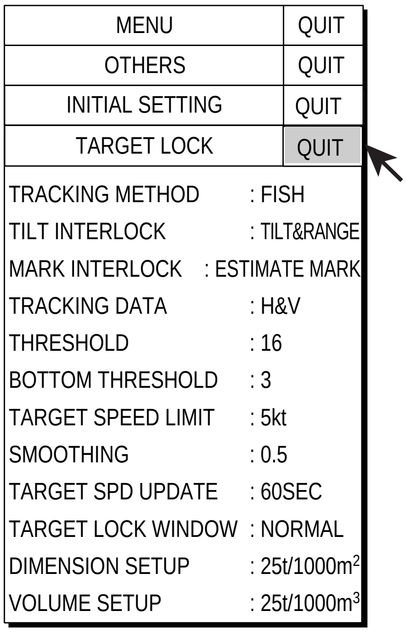
5. Select BEAMWIDTH A and set appropriate value. The higher the setting the sharper the horizontal resolution. The setting range is -4 to 5 plus AR and the default setting is 0. AR means AUTO RANGE and it automatically adjusts horizontal beamwidth according to the range.
6. Select BEAMWIDTH B and set appropriate value. This controls echo beam width by echo processing. The setting range is 0-5, and the higher the setting the greater the horizontal resolution.
7. Select QUIT and press the [MENU] key.
8. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.11 Tracking a Fish School (target lock)

The target lock function automatically tracks a fish school so you won't lose sight of it on the display. Two types of target lock are available: position tracking (TARGET MARK) and fish school tracking (FISH) and you may select one from the menu as below. Default setting is "FISH." However, if the FSV-84 cannot receive an echo of sufficient level of echo, tracking may not be performed.

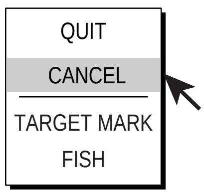
2.11.1 Selecting target lock type

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select INITITAL SETTING and press the [MENU] key.
4. Select YES and press the [MENU] key to confirm the CAUTION indicated.
5. Select TARGET LOCK and press the [MENU] key.



TARGET LOCK menu

6. Select TRACKING METHOD and press the [MENU] key to open the dialog box.



Target lock type dialog box

7. Use the trackball to select TARGET MARK or FISH as appropriate and press the [MENU] key.
8. Select QUIT and press the [MENU] key.
9. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

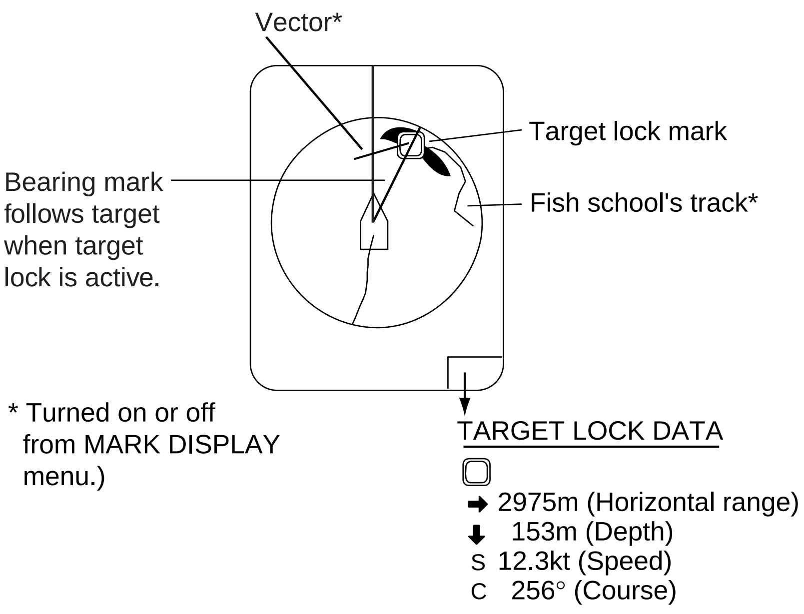
2.11.2 Fish school tracking mode

The automatic echo target lock function automatically tracks the operator-selected fish school. When menu option TILT INTERLOCK on the TARGET LOCK menu (previous page) is set to TILT & RANGE, and the tracked fish school goes out of the zone in the range direction, the range and tilt are automatically controlled according to the fish school position.

1. Select FISH at step 7 in the procedure in section 2.11.1.
2. Use the trackball to select the fish school to track on the horizontal display.
3. Press the [TARGET LOCK] key.

   The target lock mark appears (▢) on the fish school with a vector extending from its edge. This vector shows estimated target position after elapsed of preset vector time. The target lock mark is also inscribed on the vertical display, however no vector appears.

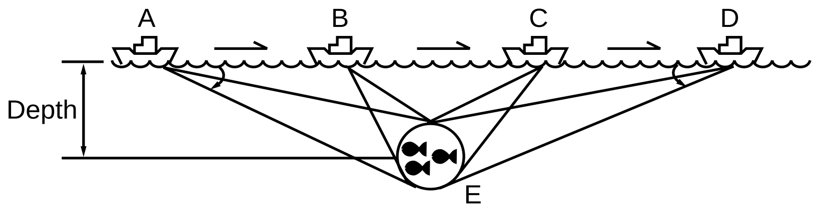
   - If the target is lost, the target lock mark changes to red color and the tracking mode changes to position mode (see next section) at that position.
   - When the FSV-84 detects and tracks the target again, the mode returns to the fish school mode.
4. To turn off the target lock, press the [TARGET LOCK] key again.



Target lock mark and target lock data

2.11.3 Position tracking mode

This mode tracks a stationary position (such as a reef) using position data fed from a navigator.

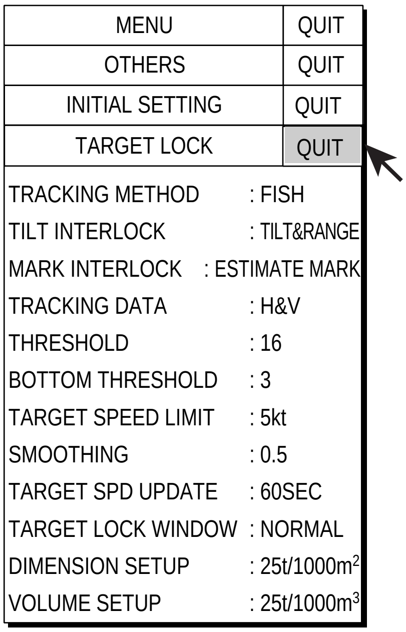


How position tracking mode target lock works

1. Select TARGET MARK at step 7 in the procedure in section 2.11.1.
2. Use the trackball to select the location to track.
3. Press the [TARGET LOCK] key to inscribe the target lock mark (▢) at the location selected. The target lock mark is also inscribed on the vertical display.

Tilt, range and vertical bearing are automatically adjusted to track the location. Using the figure above as an example, the target lock mark is placed on location “E”. Then, the equipment remembers the location of “E” and automatically changes the tilt angle as the ship moves from position A through D. As long as the fish school “E” is stationary its echo is kept displayed on the screen.

2.11.4 TARGET LOCK menu



TARGET LOCK menu

TRACKING METHOD: Selects tracking method, target mark (position) or fish.

TILT INTERLOCK: Provides automatic change of tilt angle and range or tilt angle during target lock.

MARK INTERLOCK: Selects items of numeric/graphic data display during target lock operation.

TRACKING DATA: Selects which tracking data to use; horizontal, or both horizontal and vertical.

THRESHOLD: Selects the weakest echo color number to track. The setting range is 1 to 30.

BOTTOM THRESHOLD: When a target is judged as a bottom echo, raise this setting to differentiate bottom from target. The setting range is 0 to 5. The setting range is 0 to 5.

TARGET SPEED LIMIT: Sets maximum fish speed to track. The setting range is 1kt to 15kt.

SMOOTHING: Sets smoothing rate for fish speed data. The setting range is 0.0 to 1.0.

TARGET SPD UPDATE: Sets fish speed data update interval among 15, 30, 45 and 60 seconds.

TARGET LOCK WINDOW: Selects size of target lock detection area; normal, large, largest. However, this area is not displayed on the screen.

DIMENSION SETUP: Sets dimension constant for calculation of fish school tonnage from the fish school dimension.

VOLUME SETUP: Sets volume constant for calculation fish school tonnage from fish school volume.

2.12 Detecting Fish Schools Aurally

Sometimes you may be preoccupied with other tasks and unable to concentrate on watching the sonar picture. In such cases it would be a good choice to use the audio function. This function enables you to monitor echoes from fish schools and seabed through the built-in speaker.

After you've become accustomed to monitoring fish aurally, you should be able to detect a fish school from a range longer than you can detect it on the screen. In addition you may judge whether the fish school is approaching or going away; the tone becomes higher when the school is approaching and lowers when the school is going away.

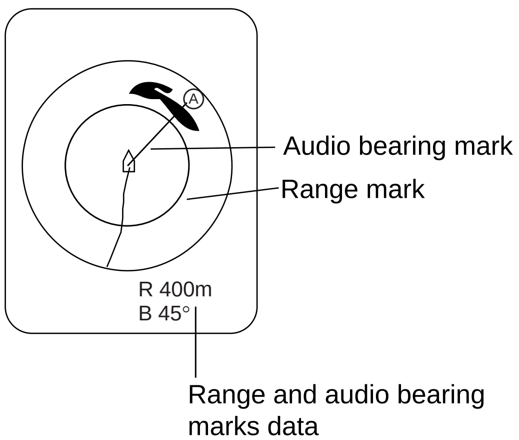
2.12.1 Selecting direction

In the default setting, the audio function is on and the audio sector is 30°.

1. Operate the trackball to place the trackball mark on the direction you want to monitor through the speaker.
2. Press the [R/B AUDIO] key.

The audio bearing mark appears on the bearing selected, in a 30°, 60°, 90°, 180° or 330° sector centering the audio bearing mark. Echoes are monitored through the speaker. You can adjust speaker volume with the [AUDIO] control.

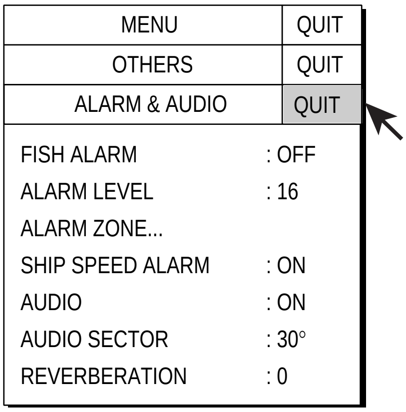
Note: When the trackball mark is placed near own ship mark and the [R/B AUDIO] key is pressed, the range mark and the related data at the bottom of the screen are erased. Note that the audio bearing is erased when "AUDIO" on the ALARM & AUDIO menu is turned off.



Range and audio bearing marks

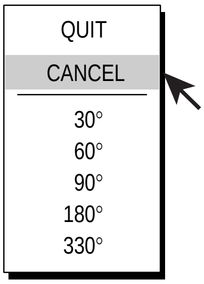
2.12.2 Selecting audio sector

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ALARM & AUDIO and press the [MENU] key.



ALARM & AUDIO menu

4. Select AUDIO SECTOR and press the [MENU] key to open the dialog box.



Audio sector dialog box

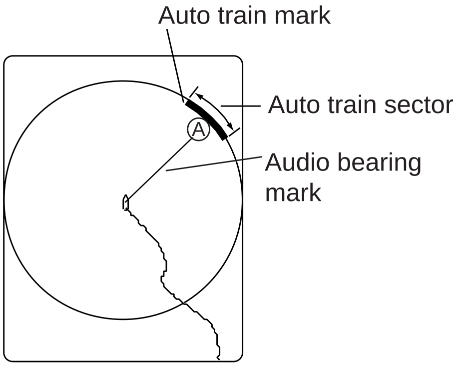
5. Select desired audio sector among 30°, 60°, 90°, 180°, 330° and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.12.3 Automatic training

You may automatically scan the audio sector and audio bearing mark in the sector of 12°, 24° or 36° as below.

1. First activate the range and audio bearing marks with the [R/B AUDIO] key.
2. While pressing and holding down the [AUTO TRAIN] key, press the [R/B AUDIO] key to select desired auto train sector among 12°, 24°, 36° and OFF. Watch the auto train mark to know the currently selected sector. The chosen sector appears in large characters for five seconds at the top of the screen.

To turn off automatic training, select OFF at step 2.



Indications related to automatic training

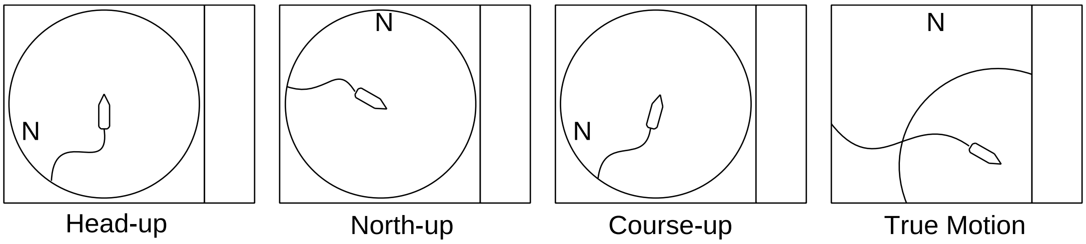
2.12.4 Reverberation

You may choose the length of reverberation for the audio signal. The larger the value the longer the reverberation, which makes it easer to hear the audio signal. The setting range is 0-9 and the default setting is 0.

2.13 Presentation Mode

2.13.1 Presentation mode description

This sonar has four presentation modes, head-up, north-up, course-up and true motion, and you may select one with PRESENTATION MODE in the OTHERS - DISPLAY SETTING menu.



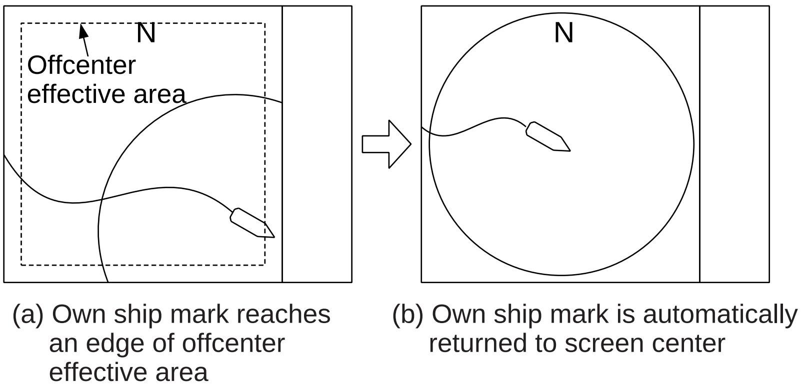
Presentation modes

Head-up: The display is oriented toward ship's heading. Own ship position is fixed at the screen center. Echoes from fish and the bottom move on the screen relative to own ship's movement. This mode is useful for general use.

North-up: The display is oriented so North is at the top of the screen. Own ship position is fixed at the screen center and own ship mark pivots with ship's movement. Echoes from fish and the bottom move on the screen relative to own ship's movement.

Course-up: The display is oriented according to course. Own ship position is fixed at the screen center. Echoes from fish and the bottom move on the screen relative to own ship's movement. Targets are displayed at ship's bow.

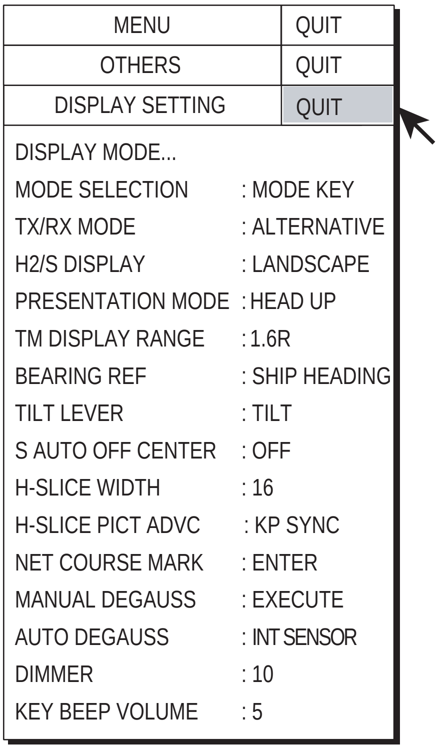
True Motion: Stationary objects are fixed and own ship and fish echoes move on the display in accordance with their true courses and speeds. Thus you can observe own ship and fish echo movement with respect to the bottom. This mode requires speed and heading data. When own ship mark reaches an edge of the off-center effective area it is automatically returned to the screen center as below.



Automatic return of own ship mark in true motion

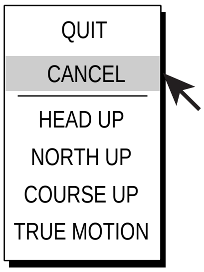
2.13.2 How to select a presentation mode

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.



DISPLAY SETUP menu

4. Select PRESENTATION MODE and press the [MENU] key to open the dialog box.



Presentation mode dialog box

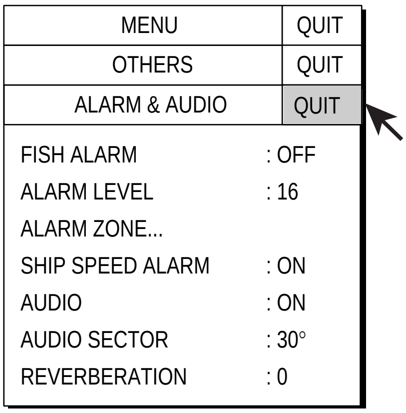
5. Select presentation mode desired and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

Note: The true motion display range may be set to 1.3 or 1.6 times the range with TM DISPLAY RANGE on the DISPLAY SETTING sub menu.

2.14 Fish Alarm

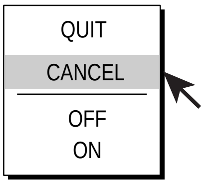
The fish alarm sounds the aural alarm when a fish echo above a preset strength enters the operator-set alarm zone.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ALARM & AUDIO and press the [MENU] key.



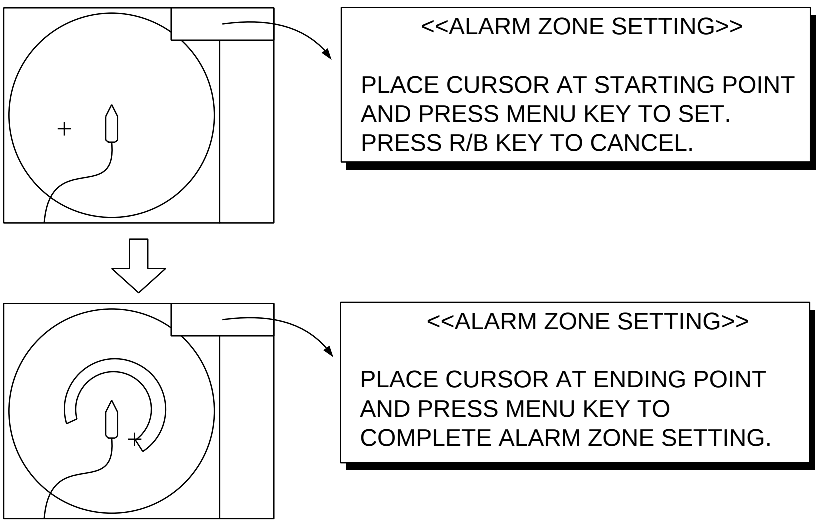
ALARM & AUDIO menu

4. Select FISH ALARM and press the [MENU] key to open the dialog box.



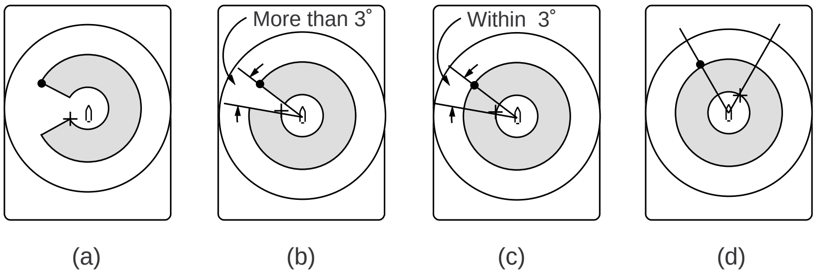
Fish alarm status dialog box

5. Select ON, select QUIT and then press the [MENU] key. To cancel the fish alarm, select OFF instead of ON.
6. Select ALARM ZONE and press the [MENU] key.
7. Operate the trackball to place the trackball mark on the starting point of the alarm zone.
8. Press the [MENU] key.
9. Rotate the trackball clockwise to select the ending point. The display paints a fan-shaped alarm zone.
10. Press the [MENU] key.
11. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.



How to set the fish alarm zone

Note 1: There must be at least three degrees difference between the starting and ending points to get a fan-shaped alarm zone as shown in (a) and (b) below. Otherwise, the unit paints a 360-degree alarm zone as in (c) where there is less than 3 degrees between the starting and ending points and (d) where the bearing marker has been rotated one full turn.



How to create desired alarm zone

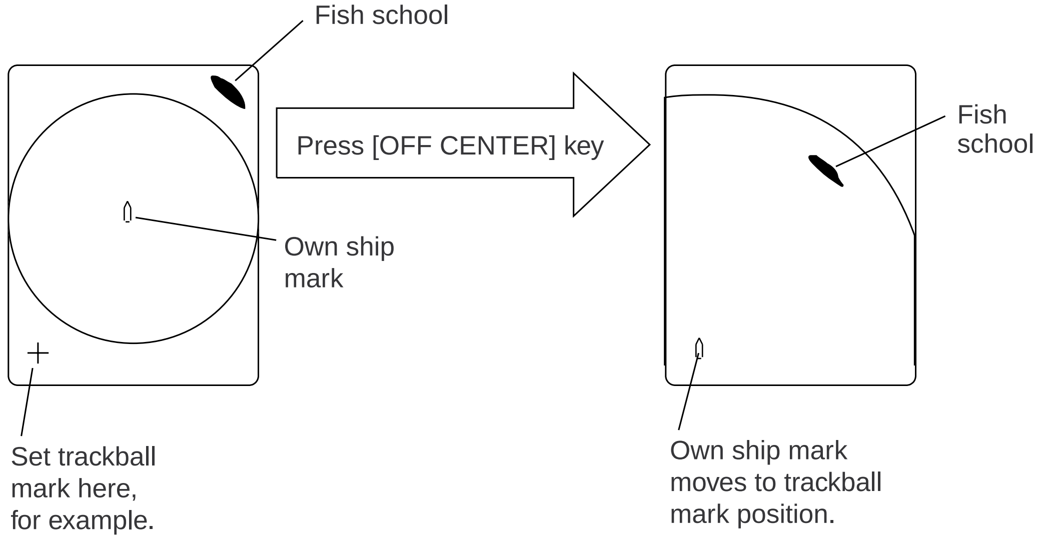
Note 2: The echo strength which triggers the alarm can be set with ALARM LEVEL on the ALARM & AUDIO menu. The setting range is 0-30.
This value corresponds with the number of 32-echo colors.

Note 3: To disable the fish alarm, choose OFF at step 5 in the procedure on the previous page.

2.15 Relocating Fish School for Easy Observation

Use the offcenter feature to relocate a fish school.

1. Operate the trackball to place the trackball mark on the position where you want to relocate the own ship mark.
2. Press the [OFF CENTER] key.
3. To move the own ship mark back to the screen center, press the [OFF CENTER] key again.

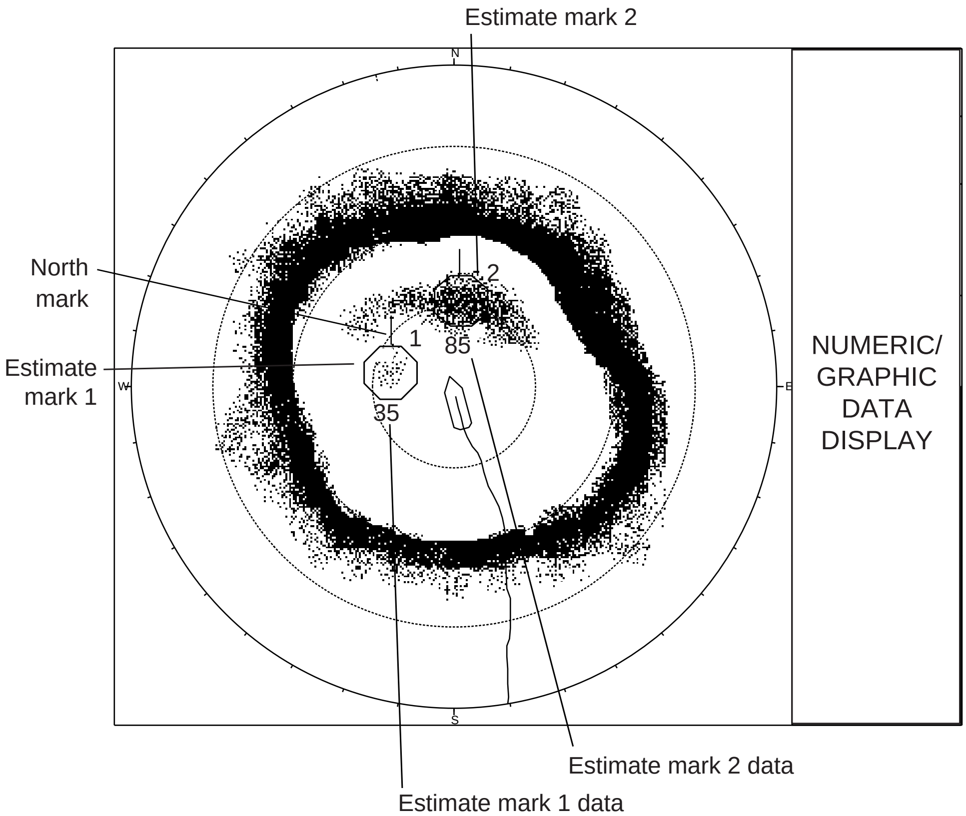


How to use offcenter

2.16 Comparing Fish School Concentration

You can get an estimate of the volume of two fish schools by using the two ESTIMATE keys as follows:

1. Operate the trackball to place the trackball mark on a fish school, and then press the [ESTIMATE 1] key.
2. The estimate mark appears on the fish school. Relative volume is shown by a figure between 0 and 100, below the estimate mark. When the area inside the mark is filled in reddish brown, volume figure is said to be “100”.
3. Operate the trackball to place the trackball mark on another fish school and press the [ESTIMATE 2] key.
4. Compare estimate figures for each fish school by observing estimate mark data and the fish histogram.
5. To turn off the estimate marks press their respective keys.



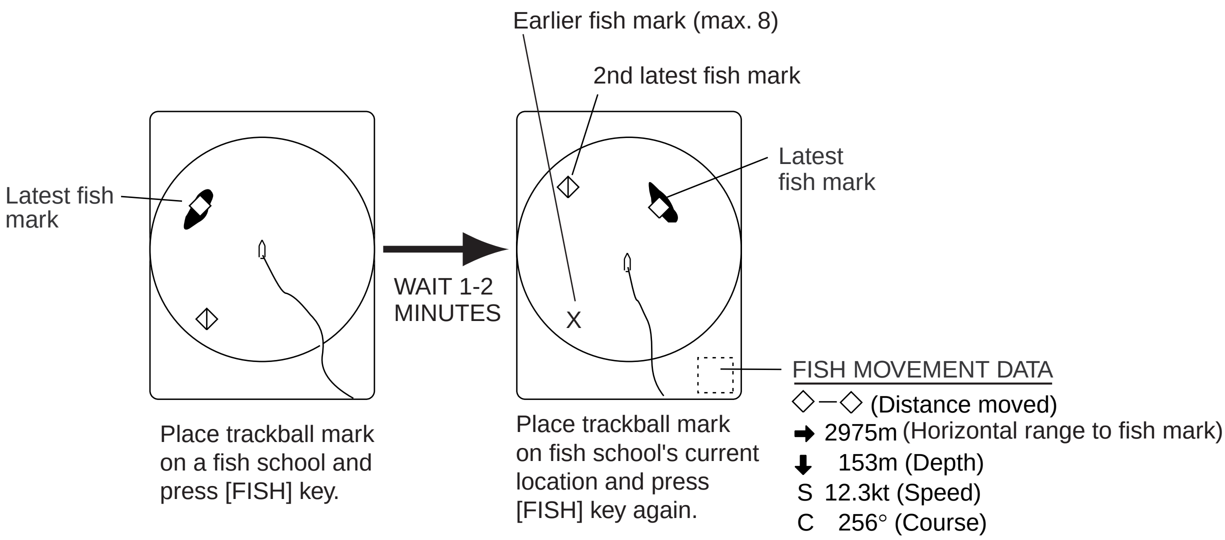
Estimate marks and their data

2.17 Measuring Fish School Speed

To ensure a good haul, it is important to estimate the direction and speed of the fish school before shooting the net. You can do this with the [FISH] key. With tidal current data plus fish speed data, you can determine the timing of the net shooting more efficiently. This function requires speed and heading data.

2.17.1 Entering fish marks

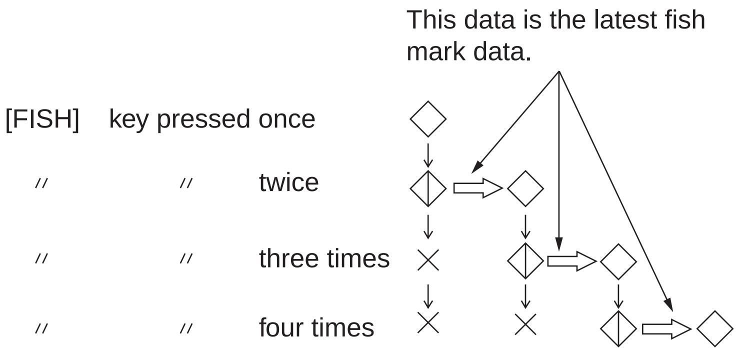
1. Place the trackball mark on the center of a fish school, and then press the [FISH] key. The latest fish mark (◇) appears on the fish school.
2. Wait 1 to 2 minutes.
3. Place the trackball mark on the same fish school selected in step 1 and press the [FISH] key. The latest fish mark appears on the target, the 2nd latest fish mark (◇) appears on the location selected at step 1 and any earlier fish marks are shown with an "X". The distance between the two fish marks and fish school course and speed appear at the bottom right-hand corner of the horizontal display area.



How to measure fish school speed

Note 1: Fish movement is calculated using ship's speed and heading data. Accordingly, pitching and rolling may affect the calculation. For best results, try the procedure two or three times to verify reliability.
Note 2: The time and distance between pressings of the [FISH] key should be as long as possible to increase accuracy of measurement. For best results, repeat the procedure two or three times.

Note 3: Each time the [FISH] key is pressed the latest fish mark and ship's speed mark change in the sequence shown below.



Fish mark

2.17.2 Deleting fish marks

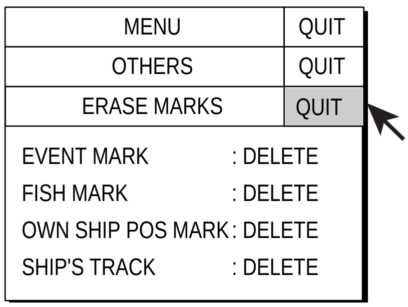
Fish marks can be deleted individually with the [DELETE MARK] key or by earliest entry through the menu. Note that the [DELETE MARK] key also erases event marks.

Deleting fish marks with the [DELETE MARK] key

Use the trackball to place the trackball mark on the fish mark you want to erase. The color of the fish mark changes from white to red when the fish mark is correctly selected. Press the [DELETE MARK] key to delete the fish mark.

Deleting fish marks through the menu

1. Press the [MENU] key to show the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ERASE MARKS and press the [MENU] key.



ERASE MARKS menu

4. Select FISH MARK and press the [MENU] key. Each press of the [MENU] key deletes the earliest fish mark.
5. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.18 Event Mark, Own Ship Position Mark

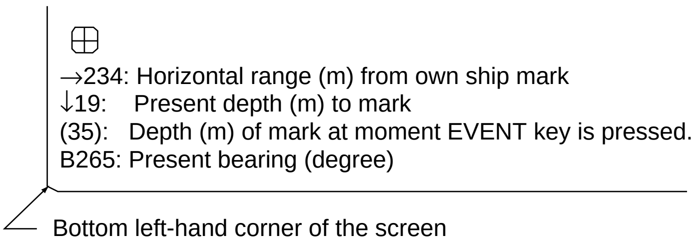
The event mark is useful for finding the horizontal range, depth and bearing to a location some distance from current position. 10 such marks may be inscribed on the horizontal display. This function requires speed and heading data.

There are two types of event marks, latest event mark (⊕) and event mark (+). Each time an event mark is entered the latest event mark appears at the trackball mark position and all other event marks are shown by the "plus" (+) mark and numbered in sequential order. When the memory capacity for event marks is reached the earliest event mark is automatically erased to make room for the latest.

The own ship position mark (△, red) is used to mark current position.

2.18.1 Entering an event mark

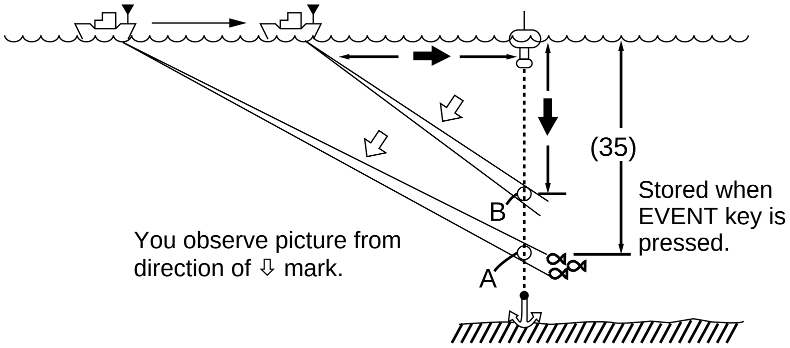
1. Set the trackball mark where you want to place an event mark.
2. Press the [EVENT] key. The horizontal range, depth and bearing to the event mark appear at the bottom left corner of the horizontal display area.



Event mark data

With speed and heading data the mark follows own ship's movements. In the True Motion mode, the event mark is stationary. When the tilt angle is changed mark position changes with slant range. Note however that the mark's position does not change when automatic tilt is active; the tilt center angle is used to position the mark.

Plotting an event mark on the display is equivalent to dropping a buoy with an anchoring chain that extends from surface to bottom. The buoy is fixed at its geographical location, but the marker on the display moves to a point where present beam plane intersects the anchor chain of the buoy as ship moves or the tilt angle is changed. This can be said about marks as well such as fish mark and trackball mark.



Event mark description

2.18.2 Entering an own ship position mark

Place the trackball mark close to the center of the own ship mark and press the [EVENT] key. Ten own ship position marks may be inscribed. When the capacity for own ship position marks is reached the earliest own ship position mark is automatically erased.

2.18.3 Deleting an event mark, own ship position mark

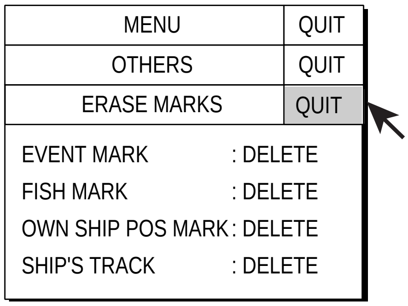
Event marks and own ship position marks can be deleted individually with the [DELETE MARK] key or by earliest entry through the menu.

Deleting event marks, own ship position mark with the [DELETE MARK] key

Use the trackball to place the trackball mark on the event mark or own ship position mark you want to erase. The color of the mark changes from white to red when the mark is correctly selected. Press the [DELETE MARK] key to delete the mark.

Deleting event marks, own ship position mark from the menu

1. Press the [MENU] key to show the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ERASE MARKS and press the [MENU] key.



ERASE MARKS menu

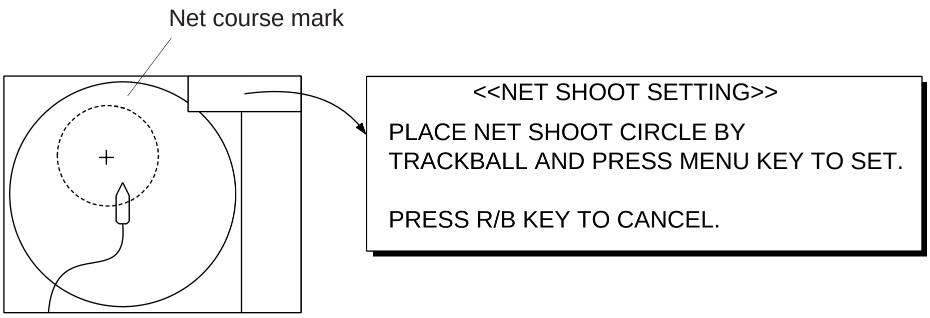
4. Select EVENT MARK (or OWN SHIP POS MARK) and press the [MENU] key. Each pressing deletes the earliest event mark (or own ship position mark).
5. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

2.19 Net Course Mark

Before shooting the net, decide the shoot timing considering tide direction, distance to the fish school and moving direction of the fish school. Use the net course mark as a guide to decide the timing. This function requires speed and heading data.

Inscribing the net course mark

1. Press the [MENU] key to open the main menu.
2. Select OTHERS and press the [MENU] key to open the OTHERS menu.
3. Select DISPLAY SETTING and press the [MENU] key to open the DISPLAY SETTING menu.
4. Select NET COURSE MARK and press the [MENU] key. Instructions for setting the net course mark appear on the display.



Net course mark

5. Use the trackball to position the net course mark, which is shown by a dashed circle.
6. Press the [MENU] key to set, and the dashed circle changes to a solid one.
7. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

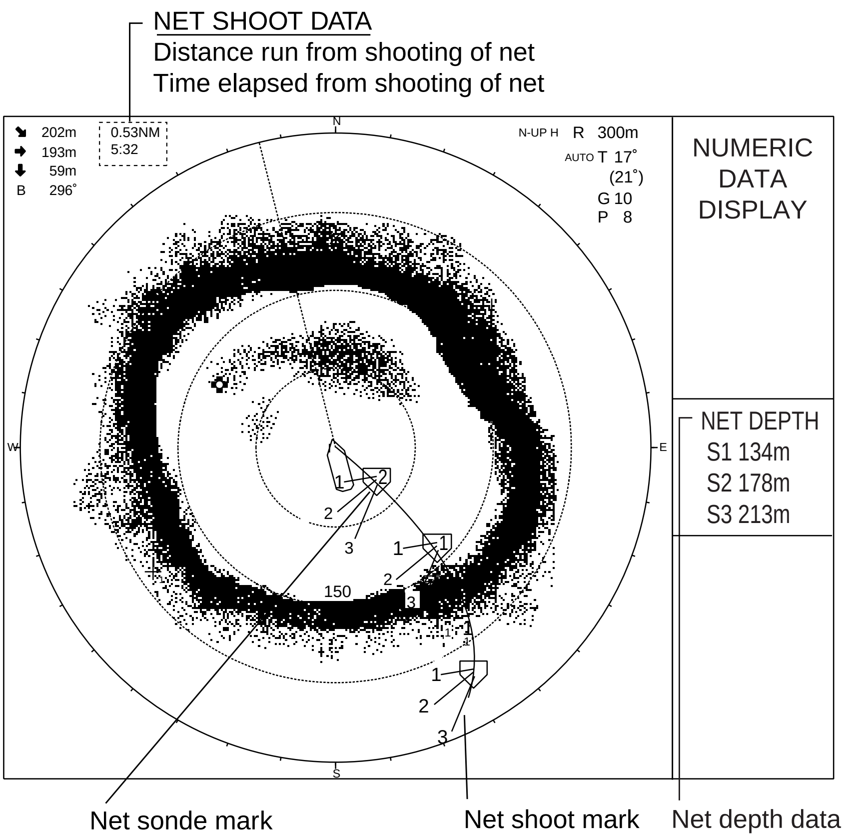
* To delete the net course mark, repeat the above procedure.

2.20 Observing Net Behavior

With net sonde connection you can observe net behavior after the throwing of the net. Accurate depiction of net sonde position depends on proper setting of the distances between net sonde transmitters. You can set those distances on the OTHERS - INITIAL SETTING - NET SONDE SETTNG menu.

This function requires speed and heading data.

1. Press the [SHOOT] key just upon throwing the net into the water. The following actions occur:
   - Net shoot mark (▽) appears at own ship position.
   - Net shoot data appears.
   - Net sonde mark is inscribed.
   - Net depth data is displayed.
   - Water depth data and water temperature data erased from own ship's track.
   - In an ES combination mode, tide data and net depth replace the water temperature graph.
   - In an ES combination mode, the picture advance method changes to "speed sync."
   - In an ES combination mode, the picture advance width appears on the ES display.
2. To erase the net sonde mark and associated data, press the [SHOOT] key again.



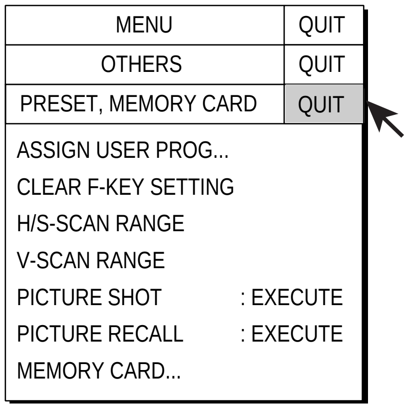
Net behavior

2.21 Storing, Recalling Picture

The current picture can be stored in the memory, and recalled whenever desired. This feature is useful for analyzing echoes.

2.21.1 Storing the picture

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select PRESET, MEMORY CARD and press the [MENU] key.



PRESET, MEMORY CARD menu

4. Select PICTURE SHOT and press the [MENU] key.
5. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.21.2 Recalling stored picture

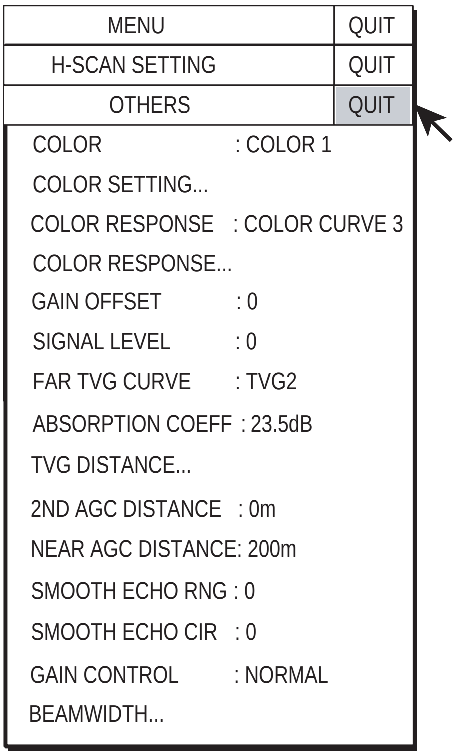
1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select PRESET, MEMORY CARD and press the [MENU] key.
4. Select PICTURE RECALL and press the [MENU] key to recall the picture stored in the memory.
5. Press the [MENU] key to erase the message displayed.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

2.22 OTHERS Menu

This section presents an overview of the OTHERS menu on the H-SCAN SETTING menu.

2.22.1 Displaying the OTHERS menu

1. Press the [MENU] key to open the menu.
2. Select H-SCAN SETTING and press the [MENU] key to open the H-SCAN SETTING menu.
3. Select OTHERS and press the [MENU] key to show the OTHERS menu.



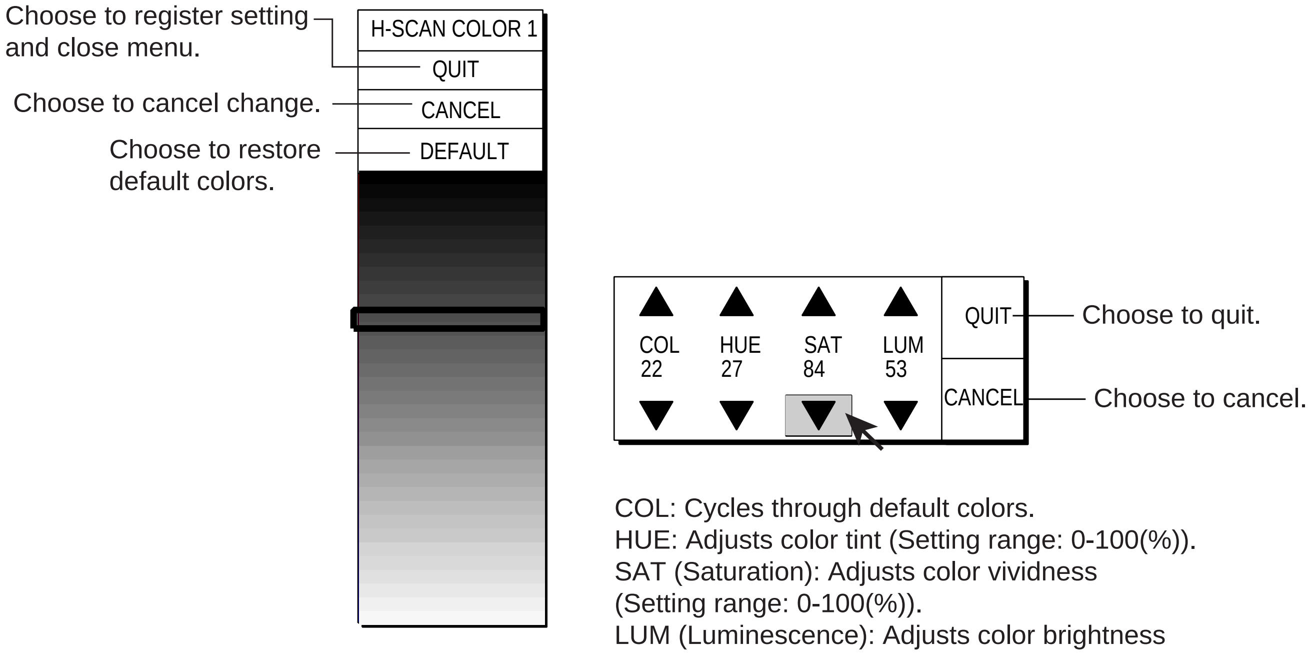
OTHERS menu

2.22.2 OTHERS menu description

COLOR: Select color arrangement to use. The default setting is COLOR 1.

COLOR SETTING…: Customizes colors.

1. Select COLOR SETTING from the OTHERS menu and press the [MENU] key. The following display appears.
2. Use the trackball to select color to change and press the [MENU] key.



COL: Cycles through default colors.
HUE: Adjusts color tint (Setting range: 0-100(%)).
SAT (Saturation): Adjusts color vividness (Setting range: 0-100(%)).
LUM (Luminescence): Adjusts color brightness (Setting range: 0-100(%)).

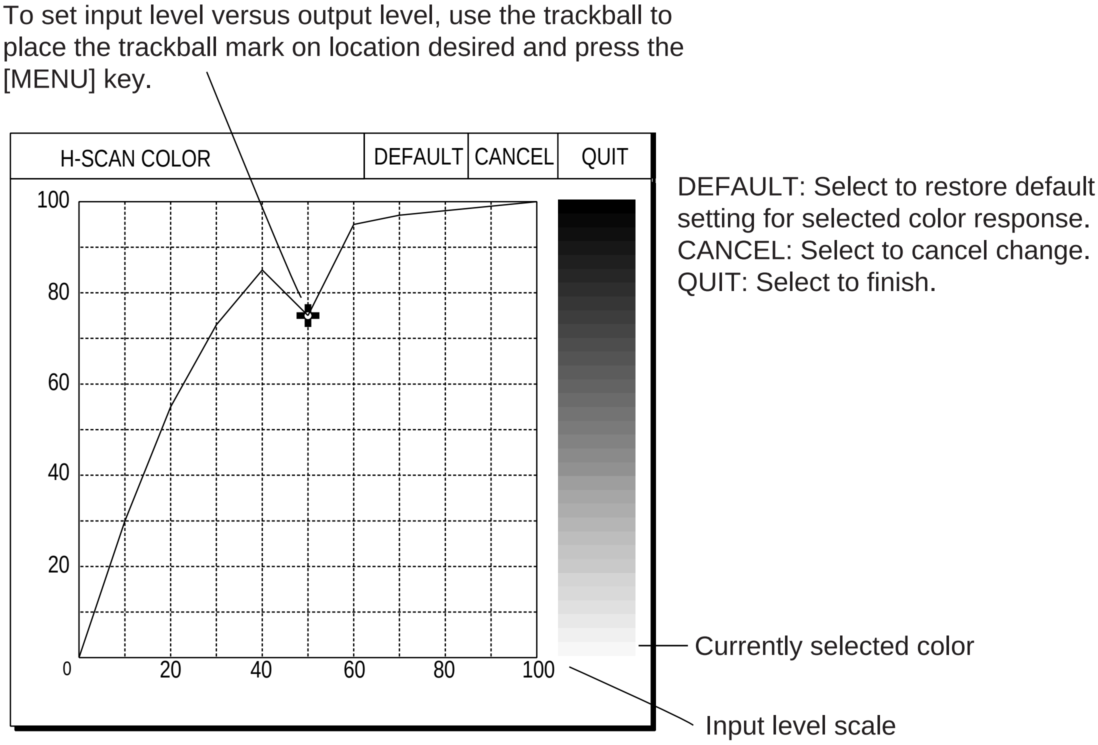
COLOR SETTING menu

3. Select ▲ or ▼ of item COL, HUE, SAT or LUM.
4. Press the [MENU] key to change the setting.
5. Repeat steps 3 and 4 to change level of other items.
6. Select QUIT and press the [MENU] key.
7. Repeat steps 2-6 to change other colors.
8. Select QUIT at the top of the menu and press the [MENU] key
9. Select QUIT at the top of the menu screen and press the [MENU] key to finish.

Note: If you get lost in operation and want to return to default colors, select DEFAULT and press the [MENU] key.

COLOR RESPONSE: Color response defines reflected echo strength versus color level conversion. You can select one of four color response tables, and the default setting is COLOR RESPONSE 3.

COLOR RESPONSE…: Adjusts reflected echo strength versus echo color level for currently selected color response number.
To adjust the curve, place the trackball at the point desired and press the [MENU] key. On the horizontal axis input level relative value is shown in the range from 0 to 100%. The setting range for input level is 0-100% in increments of 10% and output level is 0-100% in any value.



Color response curve

GAIN OFFSET: Adjusts gain level. If the front panel [GAIN] control does not provide satisfactory gain adjustment, enter an offset here. The setting range is 0-12.

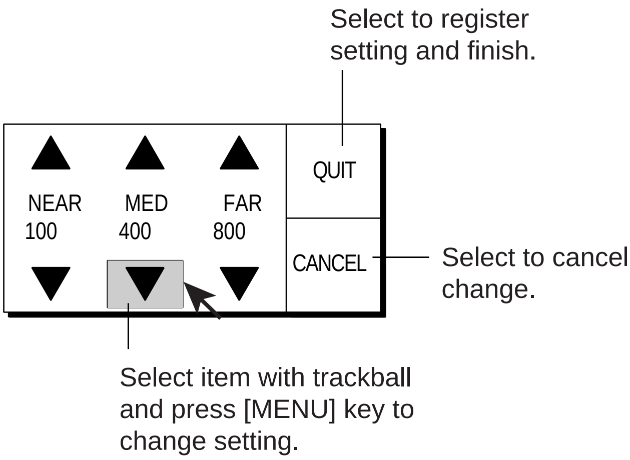
SIGNAL LEVEL: Dirty water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased in order of strength. The setting range is 0-15.

FAR TVG CURVE: Selects the TVG curve to use. The setting range is TVG1-TVG4. The higher the setting the sharper the gain curve.

ABSORPTION COEFF: Attenuation of the acoustic pulse underwater varies with sea area and water temperature. This menu item is provided to offset absorption; however, the default setting is suitable in most cases. If sensitivity decreases with distance, increase the absorption coefficient setting. And if it increases with distance decrease this setting.

TVG DISTANCE: Sets the TVG effective distance for near, medium and far ranges.

Setting range
NEAR: 50-150 m, 10 m increments
MED: 300-500 m, 20 m increments
FAR: 600-1000 m, 40 m increments
To adjust a TVG curve, select ▲ or ▼ of item desired and press the [MENU] key to change the setting.



TVG setting window

2ND AGC DISTANCE: Sets starting distance that 2nd AGC functions. The setting range is 0 to 2000 m, in increments of 20 m. Setting is invalid if display range is lower than this setting.

NEAR AGC DISTANCE: Sets Near AGC effective distance. Set the range between 20 m and 300 m, in increments of 20 m.

SMOOTH ECHO RNG: Selects echo smoothing level in the range direction. The setting range is 0-3. The higher the setting the greater the smoothing.

SMOOTH ECHO CIR: Selects echo smoothing level in circular direction. The setting range is 0-3. The higher the setting the greater the smoothing.

GAIN CONTROL: If sensitivity is low even with maximum gain, change the setting to WIDE. This doubles the control range.

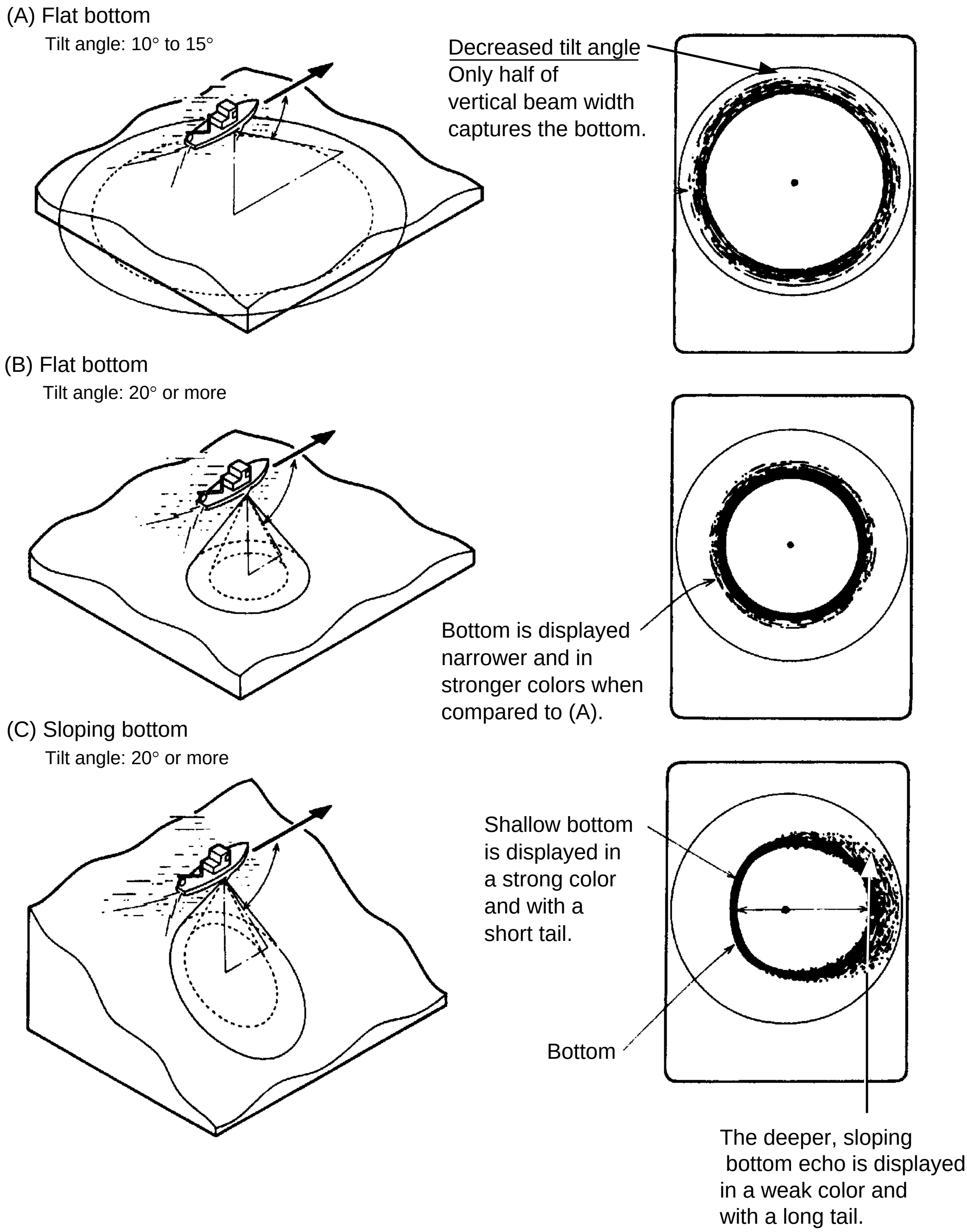
BEAMWIDTH: Adjusts horizontal beamwidth. For further details see “2.10 Adjusting Beamwidth”.

2.23 Interpreting the Horizontal Display

This section provides information necessary for interpreting the horizontal display.

2.23.1 Bottom echoes

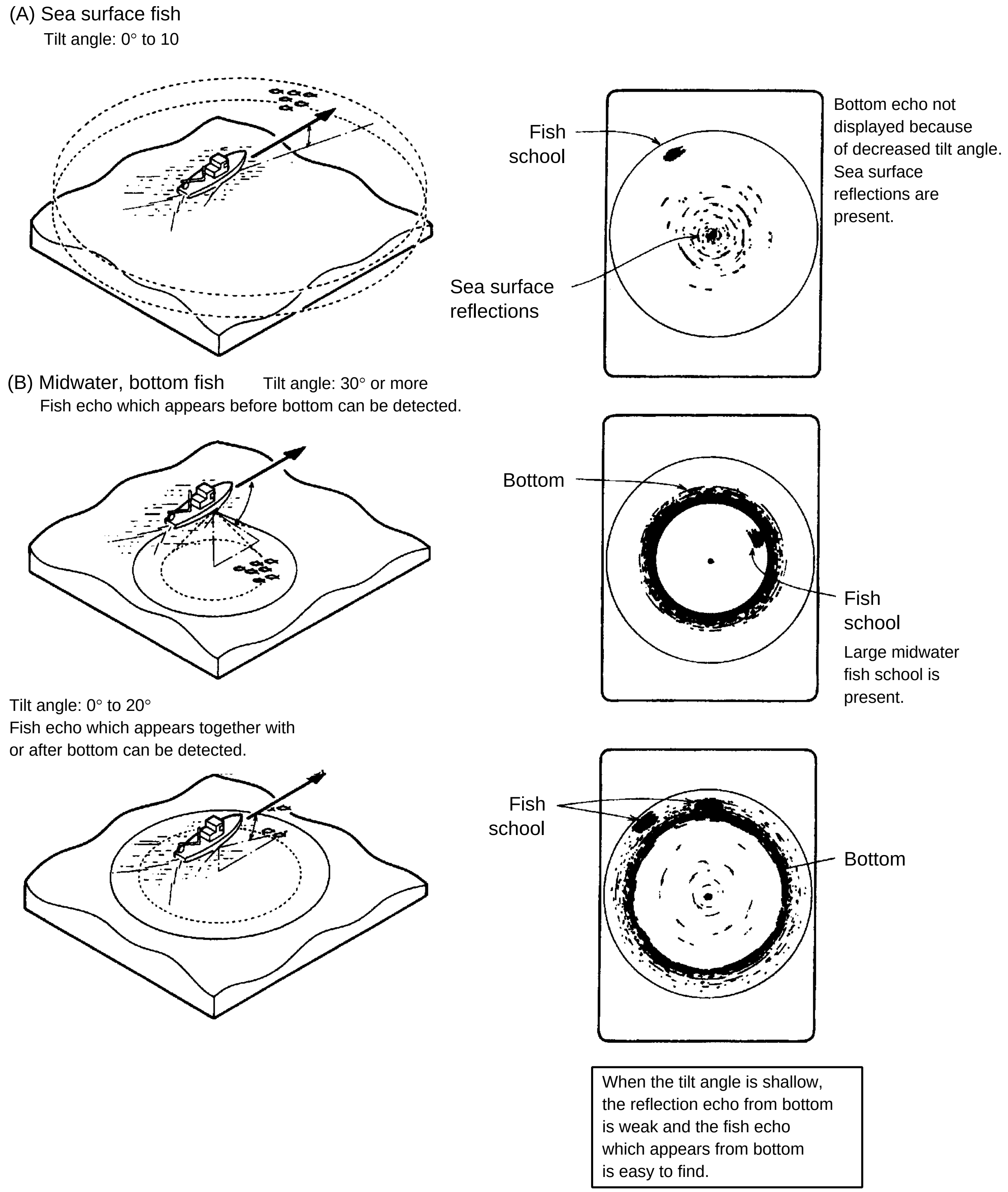
When the tilt angle is changed, the bottom echo illustrated below will appear on the display. When the tilt is decreased (toward 0°), the bottom trace becomes wider and weaker. By observing the bottom condition on the display, the skipper can prevent net damage.



Bottom echoes

2.23.2 Fish schools

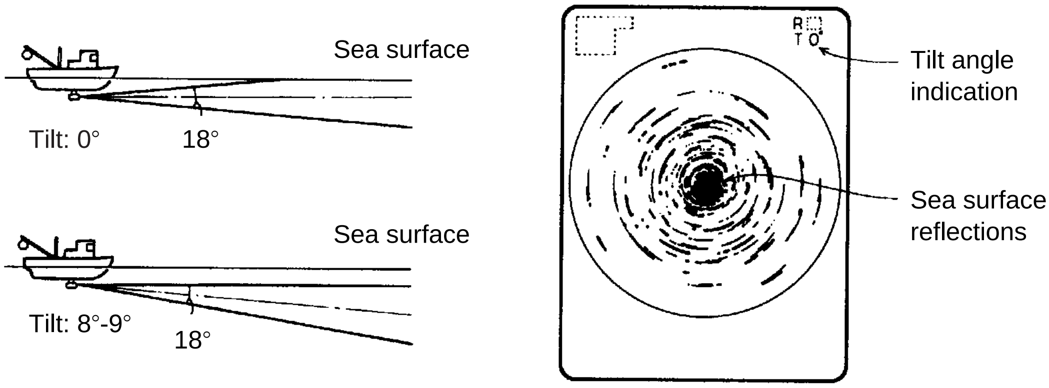
A fish school appears as a mass of echoes on the screen. The color of the mass shows the density of fish schools on the sonar beam. To find distribution and center point of a fish school, try several different tilt angles.



Fish schools

2.23.3 Sea surface reflections

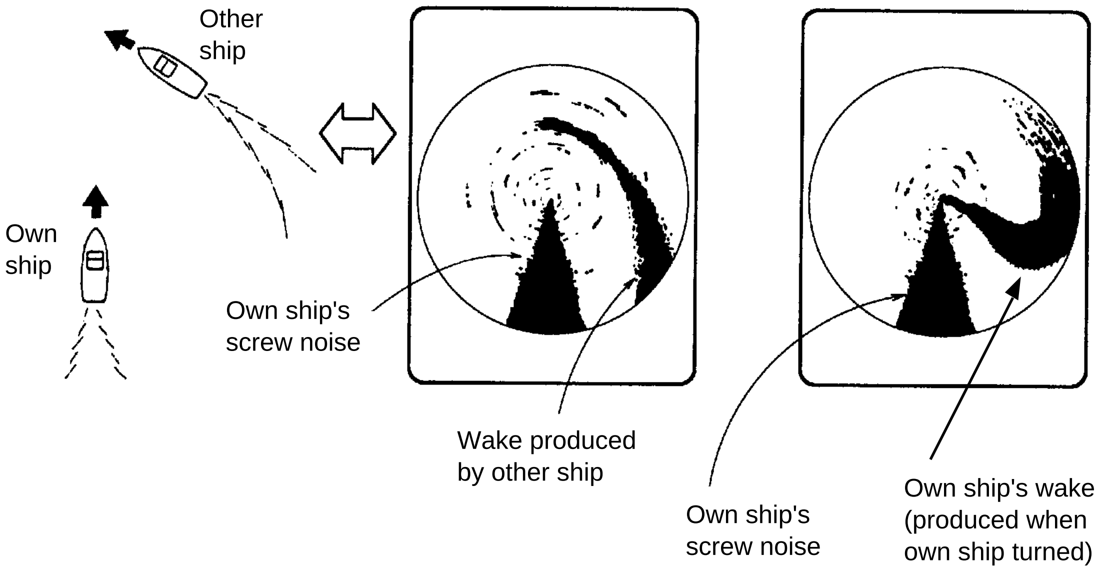
To reduce sea surface reflections, set the tilt angle to 5° or higher, so the upper edge of the sonar beam does not hit the sea surface, or adjust TVG. When a decreased tilt angle is used, sea surface reflections cover a large area as illustrated below.



Sea surface reflections

2.23.4 Wake

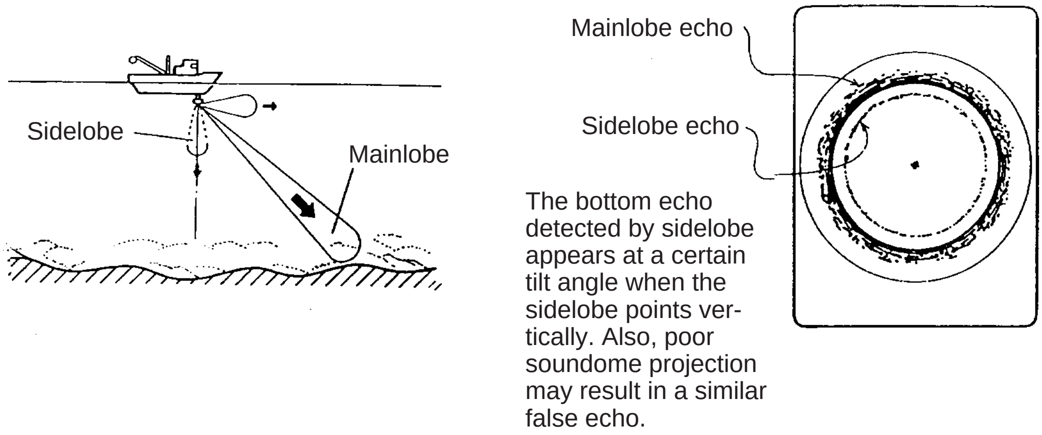
A wake produced by own ship or another ship can be a strong reflecting object when a decreased tilt angle is used. As the wake appears as a thick continuous line, it can be easily distinguished from a fish school. A wake contains many air bubbles which attenuate ultrasonic energy, making it difficult to sound beyond the wake.



Wake

2.23.5 Sidelobe echoes (false echoes)

An ultrasonic wave is emitted only in the direction set by the [TILT] control, however there are some emissions outside the main beam. These are called sidelobes. The energy of the sidelobe is fairly weak but when the water is comparatively shallow and the bottom is rocky and hard, strong signals are detected by the sidelobe. These are represented on the display as a false echo as shown below.

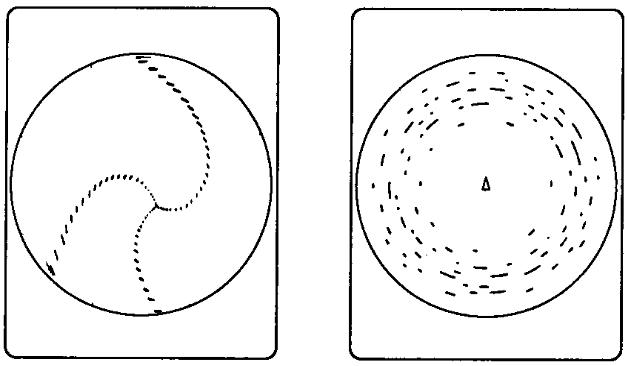


Sidelobe echoes

2.23.6 Noise and interference

When the fishing ground is crowded with many fishing boats, the sonar is subject to interference from ultrasonic equipment (echo sounder or sonar) on other boats as well as those on own ship.

For instance, interference from the sonar operated on other boats will show itself on the display as in (A) in the figure below. This interference can be suppressed by changing the TX INTERVAL on the H-SCAN SETTING menu. Noise from marine life shows itself on the displays as in (B) in the figure below. This type of noise can be suppressed with the interference rejector on the H-SCAN SETTING menu.



(A) Inteference from other sonars (yours or other's)

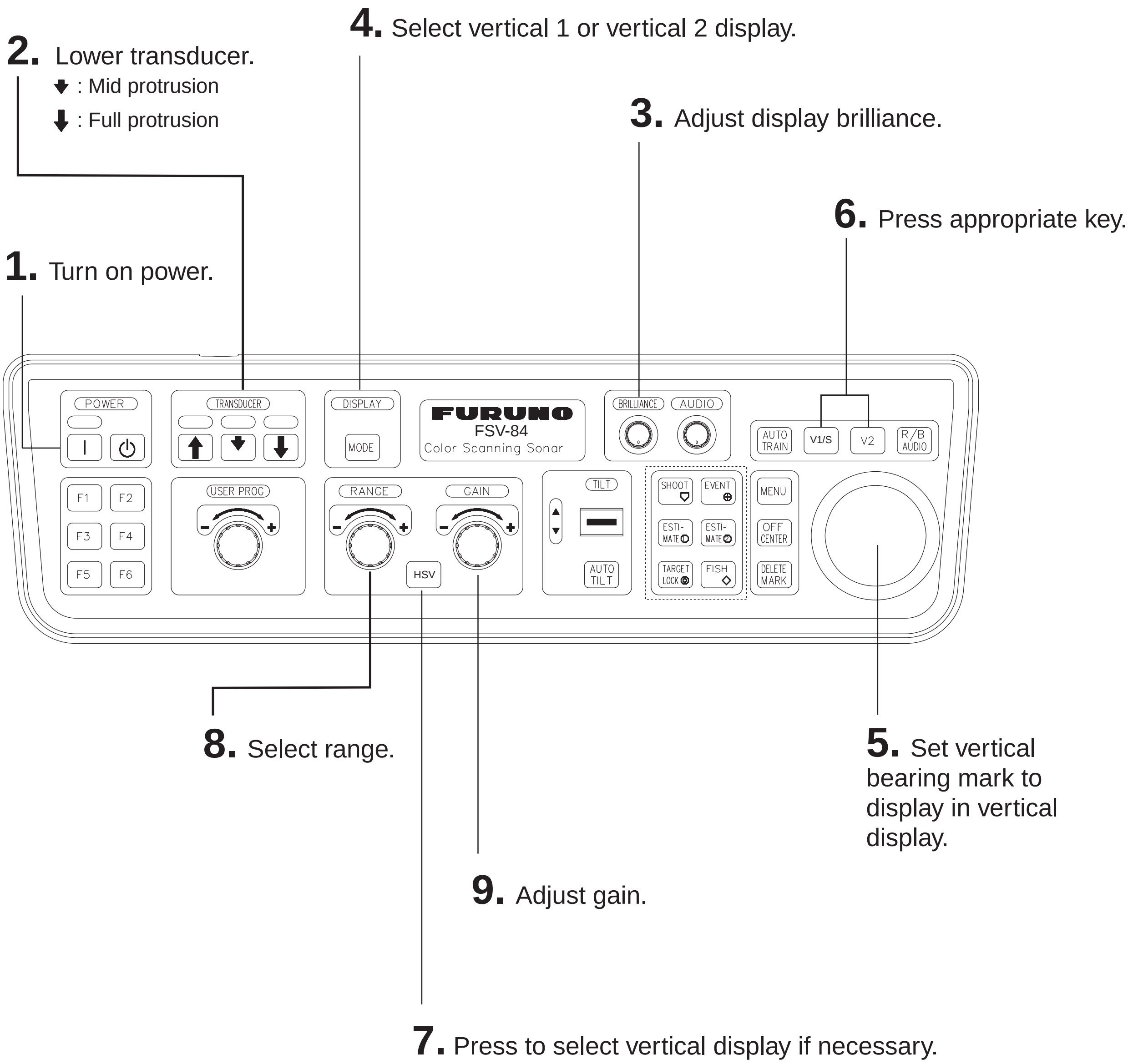
(B) Interference from marine life

Noise and interference

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3. VERTICAL MODE

3.1 Basic Operating Procedure

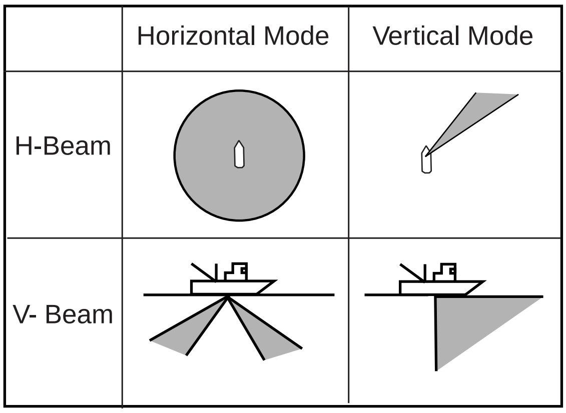


Control unit

3.2 Vertical Mode Concept

3.2.1 Overview

The vertical mode shows a vertical section of the horizontal display selected with the vertical bearing mark. The figure below illustrates the concept of the vertical mode, in comparison with the horizontal mode. The vertical mode helps you keep fast moving fish such as bonito and tuna within the sonar beam.



Vertical mode concept

3.2.2 Setting the vertical display

1. Use the trackball to place the trackball marker at the desired location in the horizontal display.
2. Press the [V1/S] or [V2] key.

For example, press the [V1/S] key. Then, the Vertical 1 display appears, and the vertical bearing marker is displayed in the horizontal display, with “V” at the tip of the marker. If both vertical displays are activated, “1” or “2” is inscribed at the tip of a vertical bearing marker.

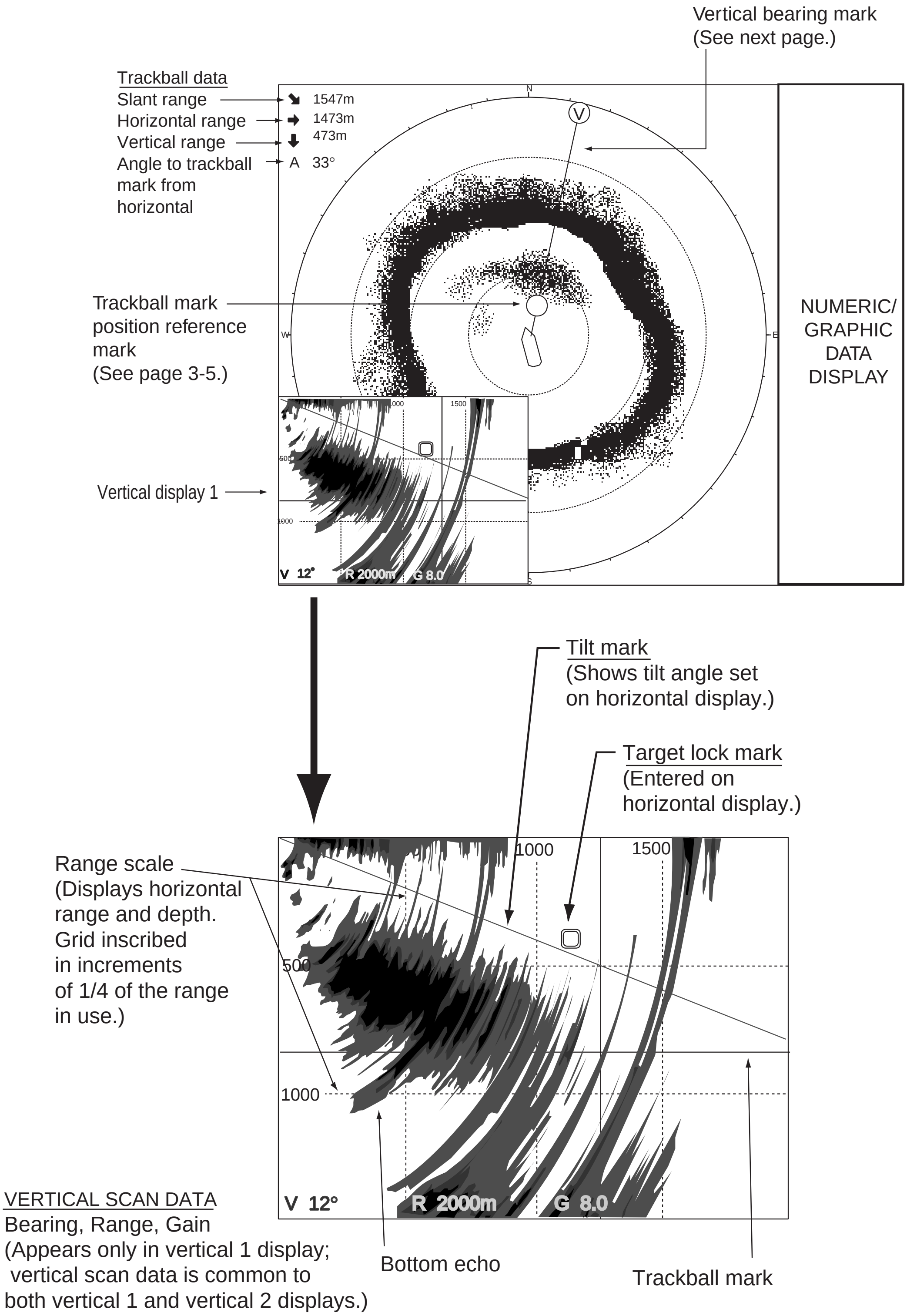
Note: The TILT control functions as a bearing setting lever for the vertical display1 in the conditions mentioned below. The bearing of the vertical display1 changes clockwise when the TILT control is pressed upward and counterclockwise when pressed downward, changing in increments of two degrees.

- The item TILT LEVER in the DISPLAY SETTING menu is set to “TILT & V1.”
- The vertical screen is chosen in the vertical mode.

3.3 Vertical Mode Indications and Marks

3.3.1 Typical vertical display

The vertical mode provides a vertical section of the horizontal picture. You may show the display on the right or left side of the screen in case of the vertical 1 mode. An expansion mode is available to enlarge the picture. To display the vertical mode press the [MODE] key and choose V1, V1 & V2, V1 & ES1 or V1 & ES2.The example below shows the V1 mode.



Vertical 1 display indications and markers

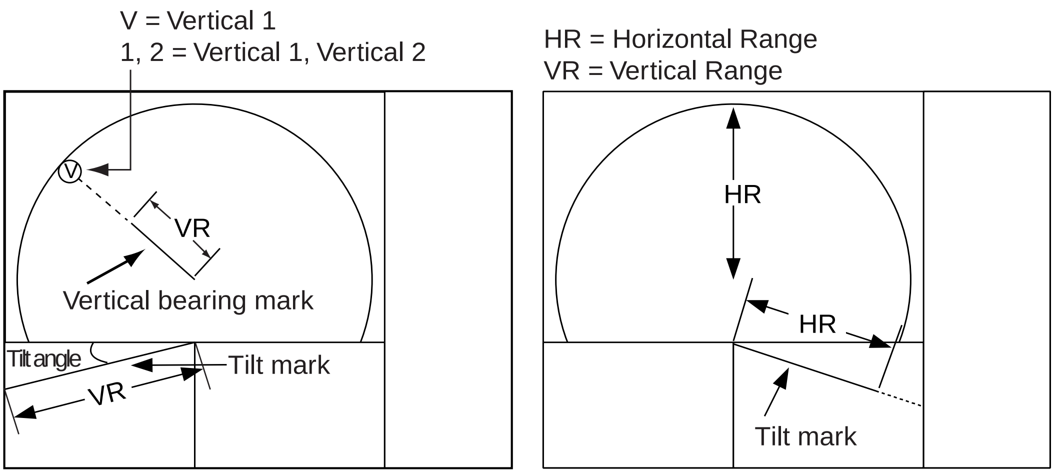
3.3.2 Vertical bearing mark, tilt mark

The vertical bearing mark is displayed with solid and dashed lines and it shows the bearing selected on the horizontal display. The circle at the top of the vertical bearing mark has a “V” inside of it in the vertical 1 mode, or “1” and “2” as appropriate when both the vertical 1 and vertical 2 modes are active. Its bearing may be referenced to North (true) or ship’s heading (relative, default setting) on the menu.

The tilt mark is a solid and dashed line which shows in the vertical display the tilt angle set on the horizontal display.

The meaning of the solid and dashed lines are as shown in the table below.

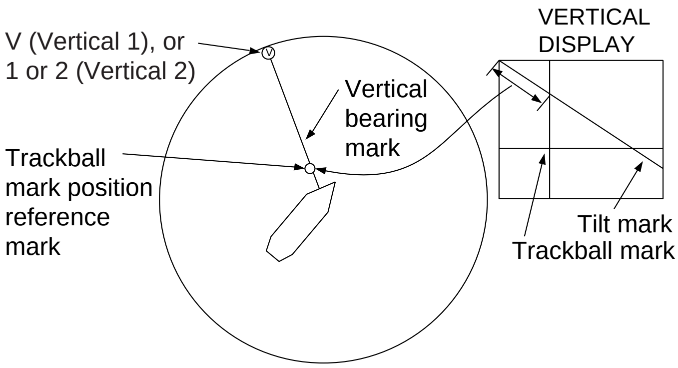
	Solid Line	**Dashed Line**
Vertical Bearing Mark	Range from own ship to vertical scan range	Range further than vertical scan range
Tilt Mark	Range from own ship to horizontal scan range	Range further than horizontal scan range



Vertical scan and horizontal scan ranges

3.3.3 Trackball mark position reference mark

The trackball mark position reference mark, a solid circle, is inscribed on the vertical bearing mark when the trackball mark is placed in the vertical display. Its purpose is to show corresponding trackball mark position on the horizontal display. It changes position with trackball mark position, tilt and range, and disappears when its position is no longer within the range of the horizontal display.



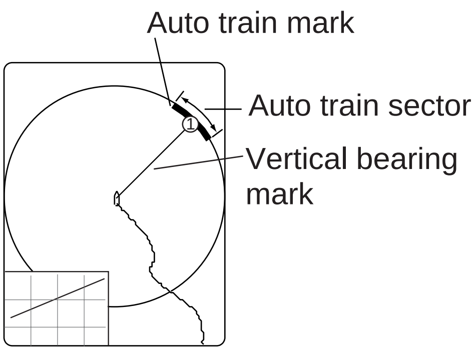
Vertical bearing mark, trackball mark position reference mark

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3.4 Auto Train

You may scan the vertical bearing mark in the sector of OFF, ±12°, ±24° and ±36°.

1. Press and hold down the [AUTO TRAIN] key while pressing the [V1/S] or [V2] key to choose auto train sector desired. Selected sector appears in large characters for five seconds for your confirmation.



Auto train

2. To quit the auto train, set OFF at the step 1.

3.5 Display Range

The [RANGE] control selects the detection range. The range selected is momentarily displayed in large characters at the center of the vertical 1 display. Range is always displayed at the lower part of the vertical 1 display.

Below are the default ranges (in meters).

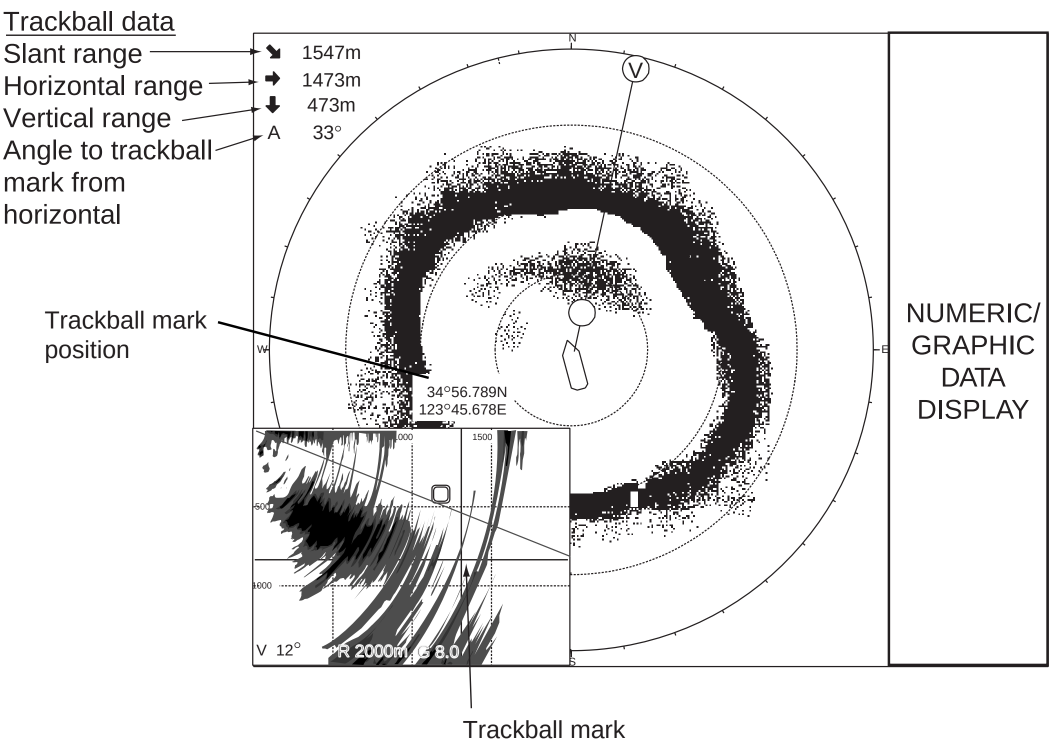
Range Setting	1	2	3	4	5	6
Range	100	200	400	600	800	1000

1. Press the [HSV] key to show the gain and range indications of the vertical mode in yellow.
2. Operate the [RANGE] control to select desired range.

Note: Ranges may be preset as desired on the PRESET, MEMORY CARD menu. For further details, see V-SCAN RANGE on page 9-5.

3.6 Measuring the Range

Operate the trackball to place the trackball mark on the vertical 1 (or vertical 2) display. The range to the location selected is shown at the top left corner.



Measuring range with the trackball

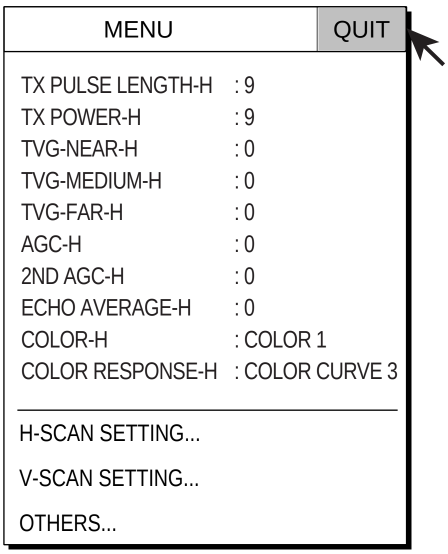
3.7 Eliminating Weak Echoes

Echoes from targets such as bottom and fish return to the transducer in order of distance to them, and when we compare their intensities at the transducer face, those from nearer targets are generally stronger when their reflecting properties are nearly equal. The sonar operator will be quite inconvenienced if these echoes are directly displayed on the screen, since he cannot judge the actual size of the target from the size of echoes displayed on the screen. To overcome use the TVG function. It compensates for propagation loss of sound in water; amplification of echoes on short range is suppressed and gradually increased as range increases so that similar targets are displayed in the similar intensities irrespective of the ranges to them.

The FSV-84 has three TVG functions, NEAR, MEDIUM and FAR, and they mainly compensate for propagation loss on short, middle and long ranges respectively, centered at the ranges as shown in the figure at the bottom of page 2-13. The higher the TVG setting the greater the amplification of echoes.

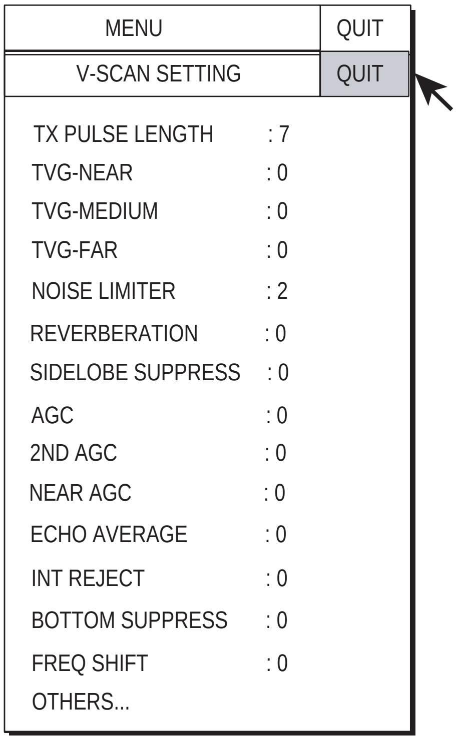
The TVG is also used to suppress unwanted echoes and noise which appear in a certain range area on the screen such as sea surface reflections and cruising noise. To set TVG properly, do the following:

1. Press the [MENU] key to open the main menu.



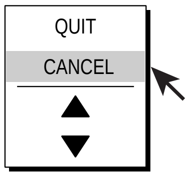
Main Menu

2. Select V-SCAN SETTING and press the [MENU] key.



V-SCAN SETTING menu

3. Select TVG-NEAR with the trackball and press the [MENU] key.



TVG setting dialog box

4. Use the trackball to select ▲ (raise setting) or ▼ (lower setting) and press the [MENU] key. The setting range is –5 to 5. The higher the setting the further the TVG works.
5. Select QUIT and press the [MENU] key.
6. Repeat steps 3 and 4 to set TVG-MEDIUM and TVG-FAR.
   When sea surface reflections or plankton layers disturb the picture, decrease appropriate TVG option by one or two steps.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

When a fish school is located on a long-range setting (about 800 meters) and is approaching own ship do as follows:

Adjust the tilt to keep the fish school in the center of the sonar beam, namely, fish school is displayed in strongest colors possible. Confirm that the fish echo is displayed in the same color as it approaches. If the color suddenly changes to weaker colors as the fish enters MEDIUM and NEAR areas, the TVG is improperly set. Adjust the TVG. If this again produces sea surface reflections and noise try to remove them with AGC and NL controls.

Note: If the above procedure does not produce satisfactory results, the TVG curve can be changed on the V-SCAN SETTING menu. Also refer to section 3.8.4 “Adjust Near AGC”.

3.8 Suppressing Bottom Tail

3.8.1 Adjust AGC

The AGC functions to automatically reduce the receiver gain only against strong echoes such as the bottom or a large fish school. Since weak echoes remain unaffected, a small fish school becomes easier to detect. Adjust it so that the AGC works only on bottom reflections. Do not set it too high; weak echoes may be missed.

1. Press the [MENU] key to open the main menu.
2. Select V-SCAN SETTING menu and press the [MENU] key.
3. Select AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.8.2 Decrease pulse length

The pulse length determines the length of the transmission pulse emitted into the water. While a longer pulse is advantageous for long-range sounding, it has the disadvantage of being poor in discrimination of targets, that is, ability to separate several closely located targets. When searching bottom fish, therefore, it is useful to shorten the pulse length in order to separate fish echoes from bottom reflections. Decrease the pulse length setting to shorten the pulse length. For search of surface and midwater fish in which bottom reflections are not so strong, use the longest pulse length “9”.

1. Press the [MENU] key to open the main menu.
2. Select the V-SCAN SETTING menu and press the [MENU] key.
3. Select TX PULSELENGTH and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the longer the pulse length.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.8.3 Adjust 2nd AGC

When an excessively strong echo is received in shallow or heavily sedimented waters, you may not be able to suppress it by the TVG control alone. In this case, a fish school which is displayed at more than 300 m away may disappear gradually when the ship is approaching the fish school.

Use the Near TVG feature to suppress this strong echo. Normally set it between 3 and 4, however, this setting depends on the sea area. Do not set it too high; all echoes (including noise) from near distance may be painted in red.

1. Press the [MENU] key to open the menu.
2. Select the V-SCAN SETTING menu and press the [MENU] key.
3. Select 2ND AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-12. The higher the setting the greater the suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.8.4 Adjust Near AGC

Sometimes excessively strong echo is received at a shallow area or an area which exists thick, polluted sea layer, which may not be corrected by the normal TVG setting. In this case, for example, fish school which is displayed at more than 300 m may disappears gradually when the ship is approaching to the fish school.

The Near AGC functions to suppress this reduction of gain. Normally set 3 to 4, however, this setting depends on a sea area. Do not set it too high; echoes from near distance may become clear red.

1. Press the [MENU] key to open the menu.
2. Select V-SCAN SETTING menu and press the [MENU] key.
3. Select NEAR AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-10. The higher the setting the greater the echo level of near distance.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.9 Rejecting Interference and Noise

While observing the vertical mode display, you may encounter occasional or intermittent noise and interference. These are mostly caused by on-board electronic equipment, engine or propeller noise, or electrical noise from other sonars being operated nearby.

3.9.1 Identifying noise source

To eliminate noise effectively, you should first identify the noise source as follows:

1. Stop transmission from the TEST menu and turn on the power of all on-board equipment one by one while observing the picture.
2. Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above two steps has effect on the picture, do one of the following:

3.9.2 Interference rejector

This control is similar to the interference rejector on echo sounders and radars. It is effective for rejecting random noise and sea surface reflections in rough sea conditions. Set it so that noise is just eliminated. Do not use an unnecessarily high setting since it may also reject small wanted echoes.

1. Press the [MENU] key to open the menu.
2. Select the V-SCAN SETTING menu and press the [MENU] key.
3. Select INT REJECT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-3. The higher the setting the greater the degree of interference rejection.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.9.3 Noise limiter

Weak, unwanted reflections, colored light-blue or green, appear when the water is dirty, plankton layers exists, or due to ship's noise. The noise limiter can reduce the effects of these unwanted reflections. Raising the setting causes unwanted reflections to become colors of blue to background color. Normally a setting of 3 or 4 is sufficient.

1. Press the [MENU] key to open the menu.
2. Select the V-SCAN SETTING menu and press the [MENU] key.
3. Select NOISE LIMITER and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-15. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.9.4 Shifting Tx frequency

If interference cannot be suppressed by the interference, shift the Tx frequency with FREQ SHIFT on the V-SCAN SETTING menu.

1. Press the [MENU] key to open the menu.
2. Select the V-SCAN SETTING menu and press the [MENU] key.
3. Select FREQ SHIFT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is -65 to +65.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.9.5 Echo average

The ECHO AVERAGE in the V-SCAN SETTING menu adjusts echo afterglow, which can be useful for watching echo movement. The setting range is 0-7. The higher the number the longer echoes remain on the screen.

3.9.6 Reverberation reduction

You may choose the length of reverberation for the echo signal in the V-SCAN SETTING menu. The larger the value the shorter the reverberation, which marks it easer to see the echo signal. The setting range is 0-3.

3.9.7 Suppressing gain of bottom echo

None-moving echoes such as bottom echo, plankton echo, etc., may be suppressed by the setting of BOTTOM SUPPRESS in the V-SCAN SETTING menu (moving echoes such as fish school are not effected by this setting). The setting range is 0 to 10. The greater the setting, the greater the suppression level of the bottom, etc.

Note: The excessive setting may suppress slow-moving fish school as well.

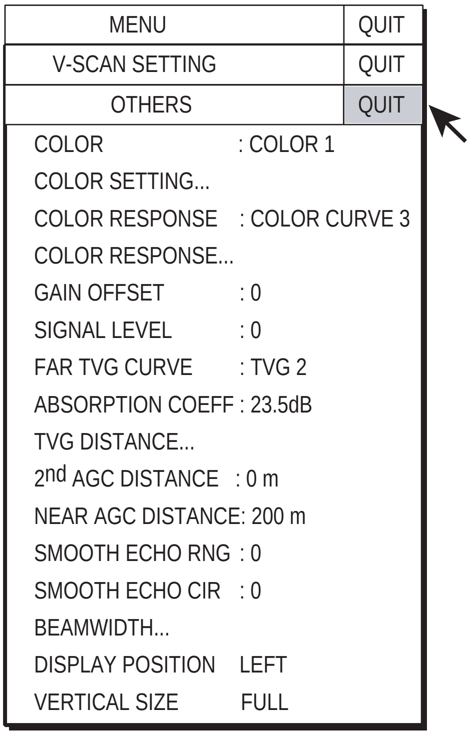
3.9.8 Suppressing sidelobes

Sidelobes on the vertical display can be suppressed in the vertical direction, with SIDELOBE SUPPRESS on the V-SCAN SETTING menu. The setting range is 0 to 3 and 0 is OFF. The higher the setting the greater the suppression.

3.10 Adjusting Beamwidth

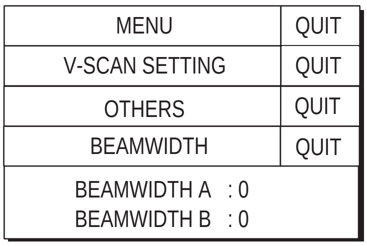
The vertical beamwidth of the Rx beam can be adjusted on the OTHERS menu to reduce surface reflections.

1. Press the [MENU] key to open the menu.
2. Select V-SCAN SETTING and press the [MENU] key.
3. Select OTHERS and press the [MENU] key.



OTHERS menu

4. Select BEAMWIDTH and press the [MENU] key.

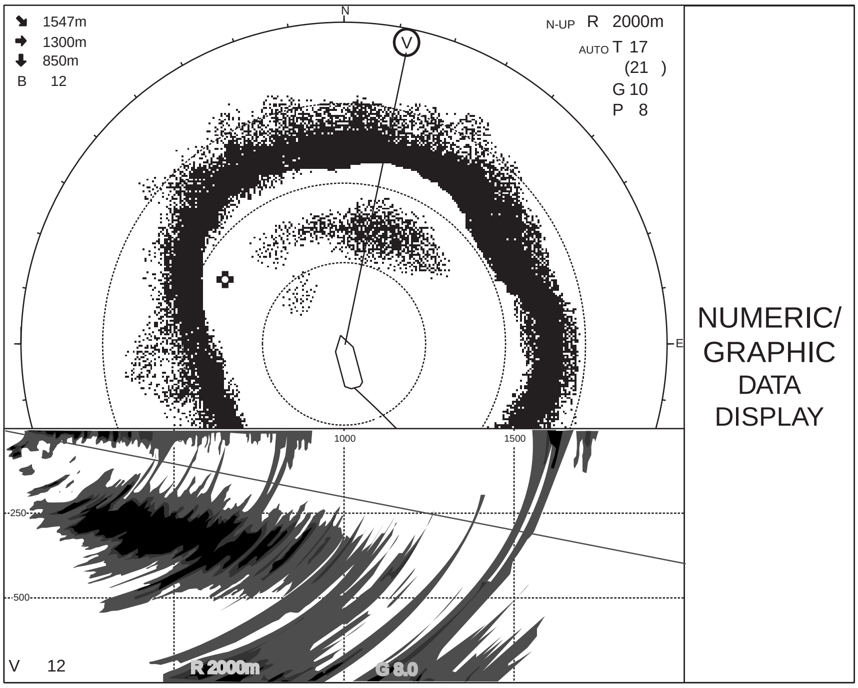


Dialog box

5. Select BEAMWIDTH A and set appropriate value. The higher the setting the sharper the horizontal resolution. The setting range is -4 to 5 plus AR and the default setting is 0. AR means AUTO RANGE and it automatically adjusts horizontal beamwidth according to the range.
6. Select BEAMWIDTH B and set appropriate value. This controls echo beam width by echo processing. The setting range is 0-5, and the higher the setting the greater the horizontal resolution.
7. Select QUIT and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

3.11 Vertical Expansion Display

The vertical expansion display enlarges the selected vertical display. Set the trackball mark on the desired location in the vertical 1 or vertical 2 display as desired and then press the [V1/S] or [V2] key, whichever is appropriate.



Vertical 1 expansion display

To quit the expansion display, press the [V1/S] or [V2] key.

3.12 OTHERS Menu

This section presents an overview of the OTHERS menu on the V-SCAN SETTING menu.

3.12.1 Displaying the OTHERS menu

1. Press the [MENU] key to open the main menu.
2. Select V-SCAN SETTING and press the [MENU] key to open the V-SCAN SETTING menu.
3. Select OTHERS and press the [MENU] key to open the OTHERS menu.

MENU	QUIT
V-SCAN SETTING	QUIT
OTHERS	QUIT
COLOR	: COLOR 1
COLOR SETTING...	
COLOR RESPONSE	: COLOR CURVE 3
COLOR RESPONSE...	
GAIN OFFSET	: 0
SIGNAL LEVEL	: 0
FAR TVG CURVE	: TVG 2
ABSORPTION COEFF	: 23.5dB
TVG DISTANCE...	
2nd AGC DISTANCE	: 0 m
NEAR AGC DISTANCE	: 200 m
SMOOTH ECHO RNG	: 0
SMOOTH ECHO CIR	: 0
GAIN CONTROL	: WIDE
BEAMWIDTH...	
DISPLAY POSITION	LEFT
VERTICAL SIZE	FULL

OTHERS menu

3.12.2 OTHERS menu description

COLOR: Select color arrangement to use. The setting range 1-4.

COLOR SETTING: Customizes colors on the vertical display. Operation is same as that for the horizontal display. For further details see “COLOR SETTING…” on page 2-48.

COLOR RESPONSE: Color response defines reflected echo strength versus color level conversion. You can select one of four color response tables, and the setting range is 1-4.

COLOR RESPONSE…: Adjusts reflected echo strength versus echo color level for currently selected color response number. Operation is the same as that for the horizontal display. For further details see “COLOR RESPONSE…” on page 2-48.

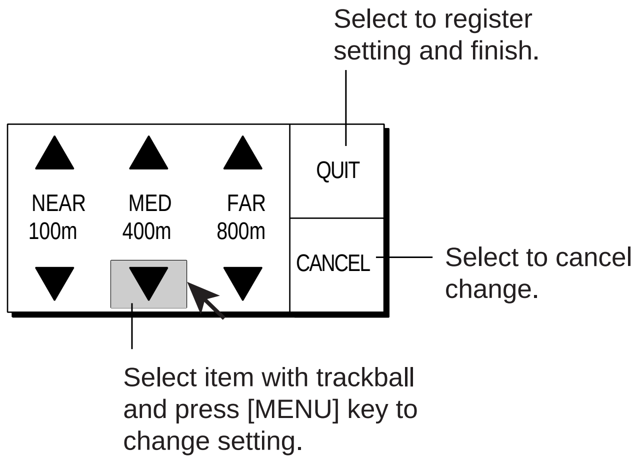
GAIN OFFSET: Adjusts gain level. If the front panel [GAIN] control does not provide satisfactory gain adjustment, enter an offset here. The setting range is 0-12.

SIGNAL LEVEL: Dirty water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased in order of strength. Select the signal level to erase with the trackball and press the [MENU] key. The setting range is 0-15.

FAR TVG CURVE: Selects the TVG curve to use. The smaller the number the gentler the gain change over distance.

ABSORPTION COEFF: Attenuation of the acoustic pulse underwater varies with sea area and water temperature. This menu item is provided to offset absorption, however the default setting is suitable in most cases. If sensitivity decreases with distance, increase the absorption coefficient setting. And if it increases with distance decrease this setting.

TVG DISTANCE…: Sets the TVG effective distance for near, medium and far ranges.
Setting range
NEAR: 50-150 m, 10 m increments
MED: 300-500 m, 20 m increments
FAR: 600-1000 m, 40 m increments
To adjust a TVG curve, select ▲or ▼of item desired and press the [MENU] key to change the setting.



Setting window

2ND AGC DISTANCE: Sets starting distance that 2nd AGC functions. The setting range is 0 to 2000 m, in increments of 20 m. Setting is invalid if display range is lower than this setting.

NEAR AGC DISTANCE: Sets Near AGC effective distance. Set the range between 20 m and 300 m in increments of 20 m.

SMOOTH ECHO RNG: Selects echo smoothing level in the range direction. The setting range is 0-3. The higher the setting the greater the smoothing.

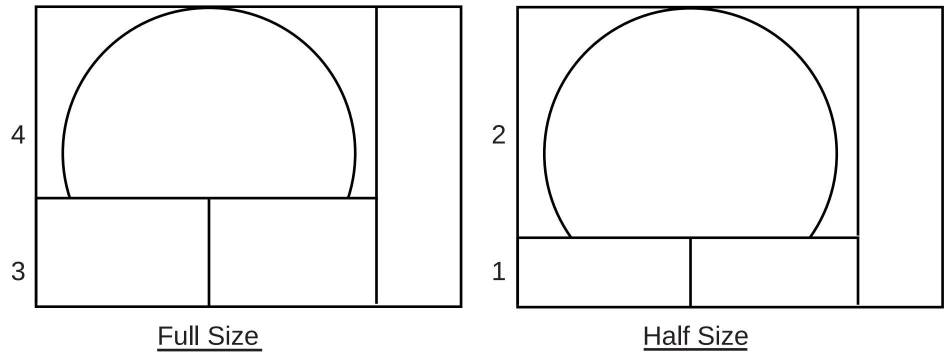
SMOOTH ECHO CIR: Selects echo smoothing level in circular direction. The setting range is 0-3. The higher the setting the greater the smoothing.

GAIN CONTROL: If sensitivity is low even with maximum gain, change the setting to WIDE. This doubles the control range.

BEAMWIDTH: See page 3-15.

DISPLAY POSITION: Selects where to display the vertical display, left side or right side. Left side is the default setting.

VERTICAL SIZE: Selects display size from full and half. Choose “half” to expand the effective viewing area on the horizontal display, The ratio for the full-size display is H4:V3 and H4:V2 for the half-size display.



Display size

3.13 Application to Bonito and Tuna Fishing

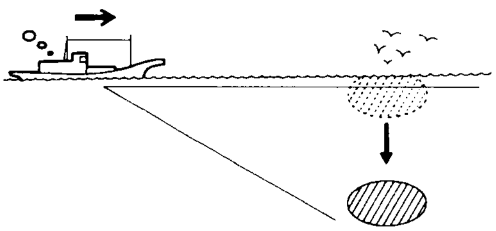
Tracking of bonito and tuna presents a special challenge to the sonar operator: He must try to keep them within the sonar beam, a formidable task considering their high speed and penchant for leaping and diving. The FSV-84, however, with its vertical beam, makes this task easier.

3.13.1 Searching

Neither the naked eye nor binoculars can continually track fish schools which make lightning quick runs between the surface and midwater. A sonar, however, provides a continuous view of several hundred meters of sea area around the boat, both at the surface and below it.

3.13.2 Tracking

If you are visually tracking a fish school which characteristically leaps and dives regularly, or a school with a flock of birds hovering over it, the school will scatter once the vessel approaches, thus you will lose sight of the school. This sonar provides continuous pictures of underwater conditions, so you can always know where a fish school is. For tracking the schools which leap and dive often the vertical mode is especially effective.

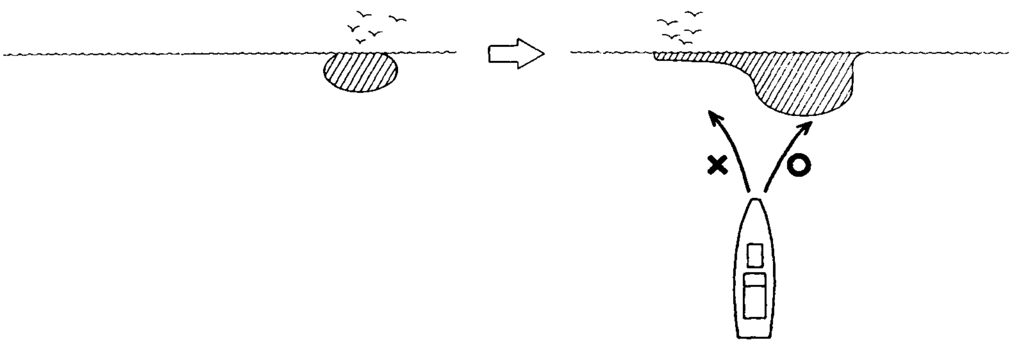


Tracking

3.13.3 Approaching

The sonar lets you view fish school movement continuously, thus you can approach a school confident of a good catch.

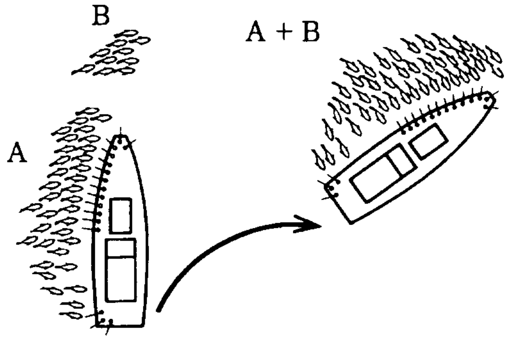
While a flock of birds hovering over the sea surface is usually a good indication of the presence of a fish school, the sonar can better verify fish school size.



Approaching

3.13.4 Catching

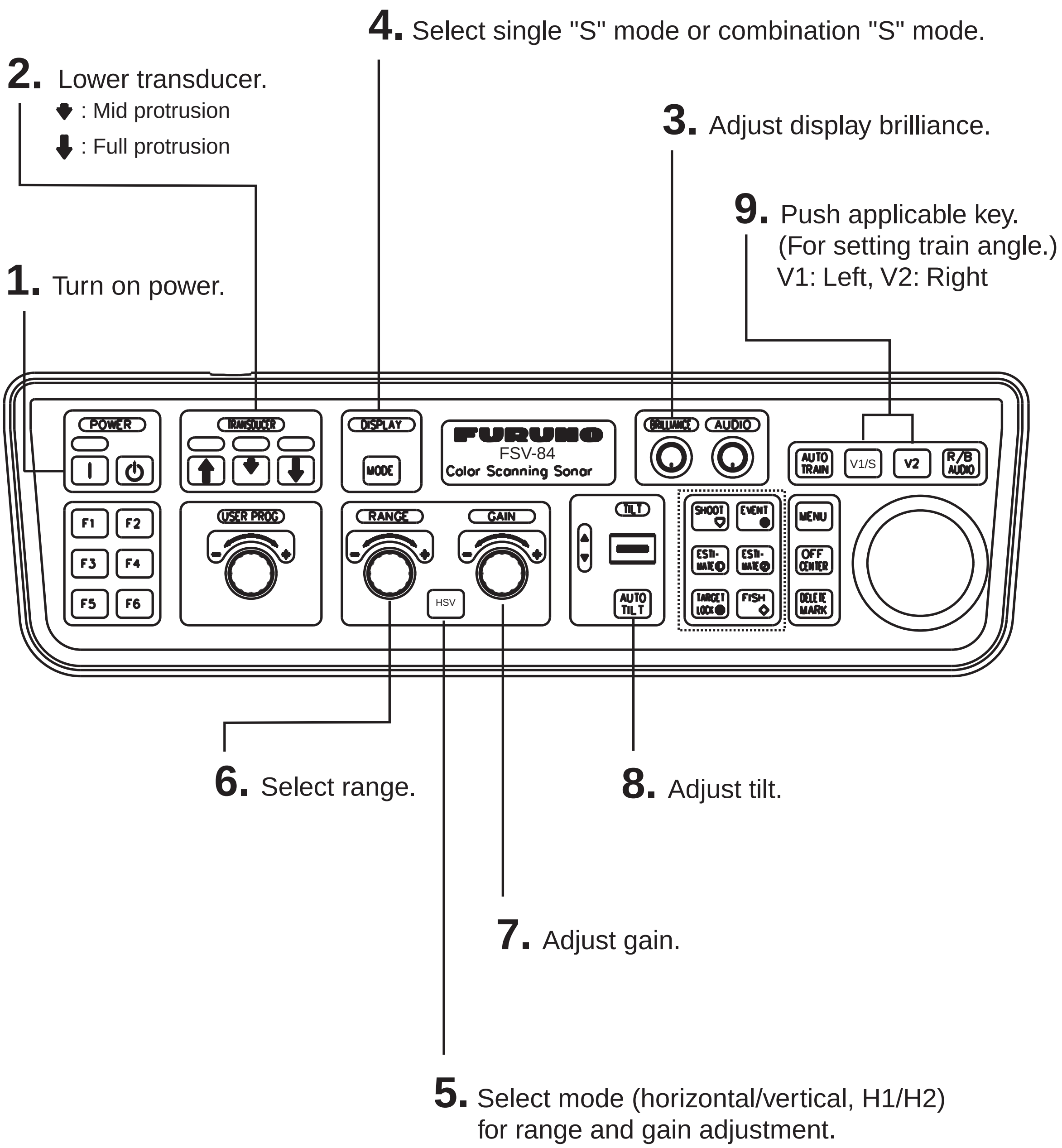
While the sonar operator monitors the sonar for other fish schools, the crew can scatter bait and water to attract fish to the boat.



Catching

4. SLANT MODE

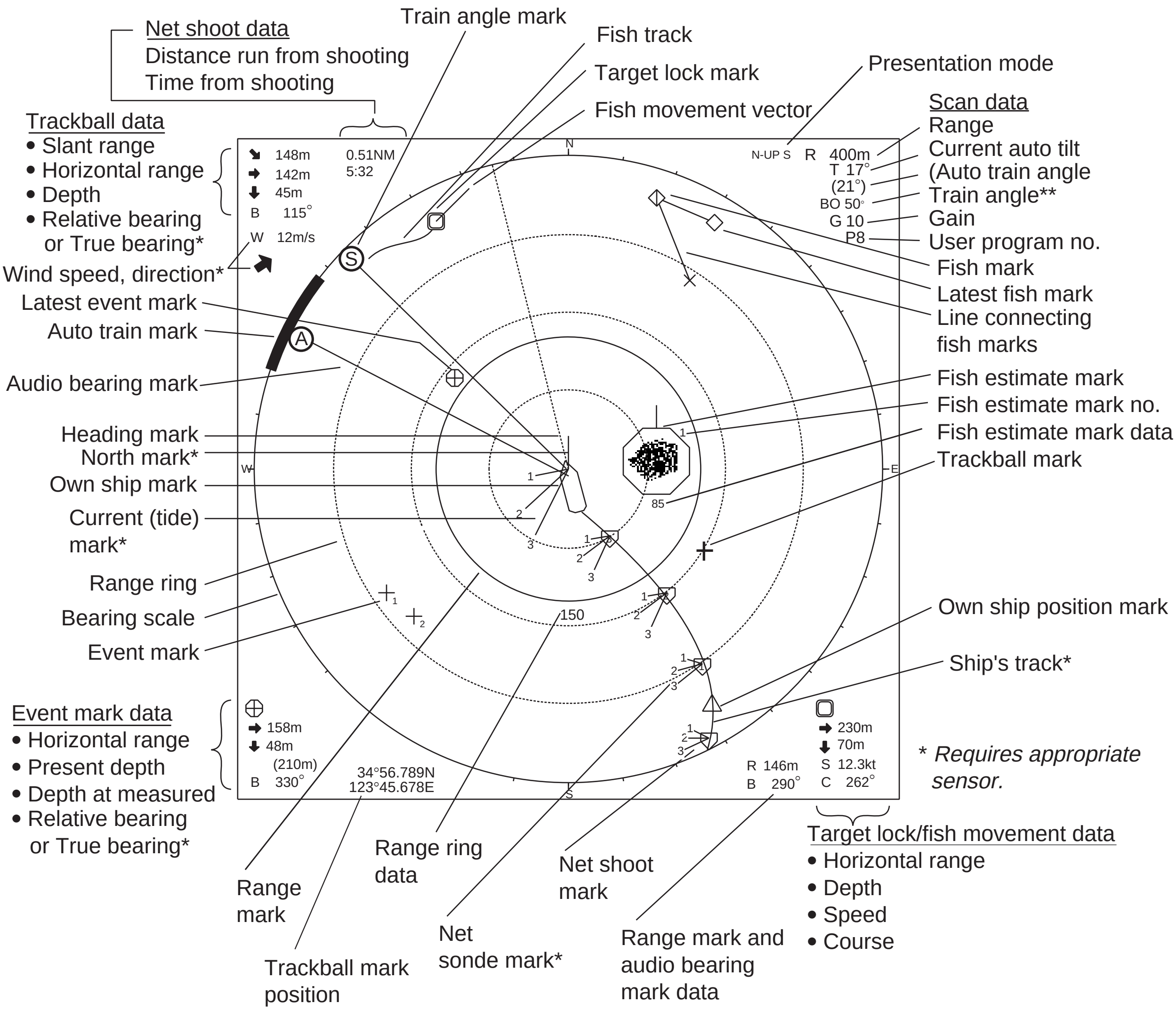
4.1 Basic Operating Procedure



4.2 Indications and Marks

4.2.1 Slant mode single display

The slant mode provides a half-circle (180°) picture, with own ship at the center. To choose the slant mode single display, press the [MODE] key to choose “S”. (Presetting of DISPLAY MODE on the DISPLAY SETTING menu is required.)

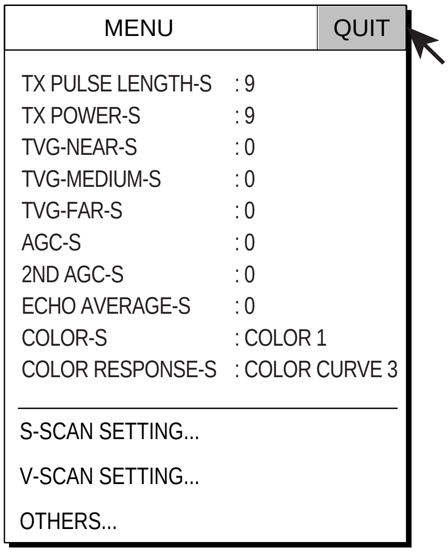


** The slant mode provides a half-circle display. Other than the train angle indication, the indications are the same as those on the horizontal display.

4.2.2 Slant mode combination display

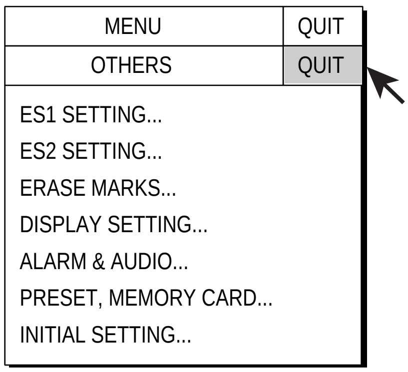
The slant mode combination display shows one of four kinds of horizontal display combinations: LANDSCAPE, PORTRAIT, RIGHT INSET and LEFT INSET.

1. Press the [MENU] key to open the main menu.



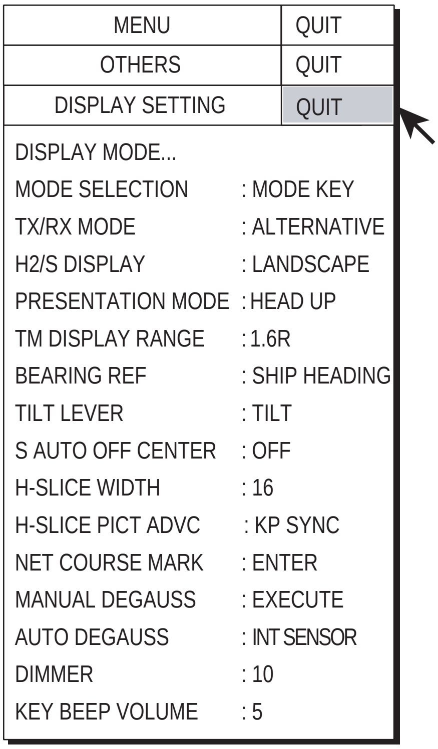
Main Menu

2. Select OTHERS with the trackball and press the [MENU] key to open the OTHERS menu.



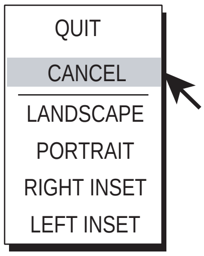
OTHERS menu

3. Select DISPLAY SETTING and press the [MENU] key to open the DISPLAY SETTING menu.



DISPLAY SETTING menu

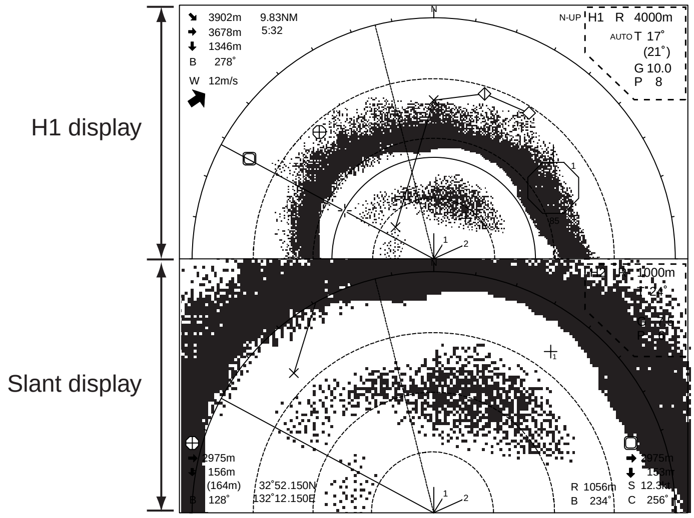
4. Select H2/S DISPLAY and press the [MENU] key.



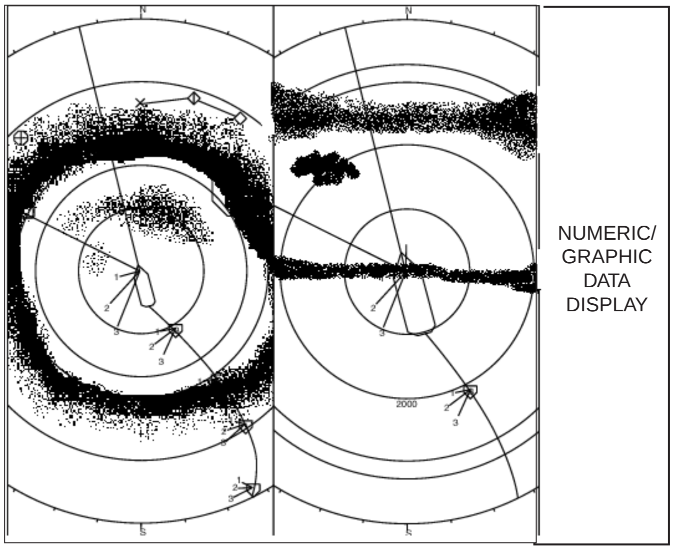
Dialog box for setting slant combination display

5. Select the desired combination with the trackball and press the [MENU] key.
6. Select QUIT and press the [MENU] key to finish.

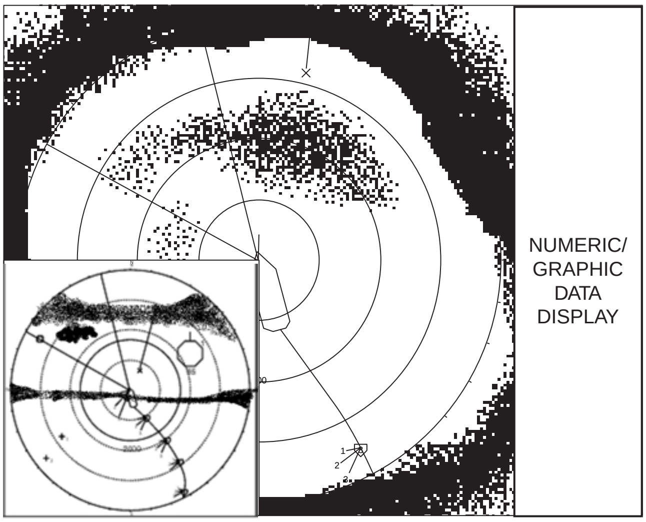
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.



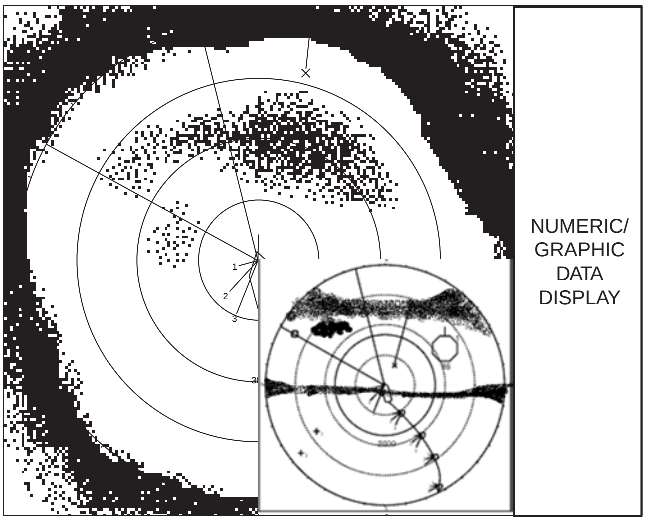
LANDSCAPE



PORTRAIT



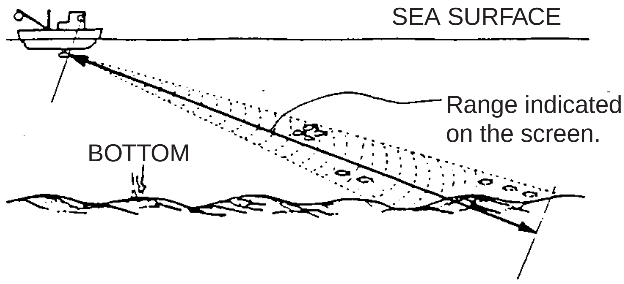
LEFT INSET



RIGHT INSET

4.3 Display Range

The [RANGE] control selects the detection range. The range selected is momentarily displayed in large characters at the top of the screen. Range is always displayed at the top right hand corner of the screen.



Range concept

Below are the default ranges (in meters).

Range Setting	1	2	3	4	5	6
Range	100	200	400	600	800	1000

1. If the slant display or slant combination display is active, press the [HSV] key to choose the slant mode.
   Range and gain indications for the slant display are shown in yellow.

2. Operate the [RANGE] control to select desired range.

Note 1: Ranges may be preset as desired on the PRESET, MEMORY CARD menu. For further details, see H/S-SCAN RANGE on page 9-5.

Note 2: With the target lock feature active, range is automatically changed according to target position. (INTERLOCK on the TARGET LOCK menu is set to the option TILT&RANGE.)

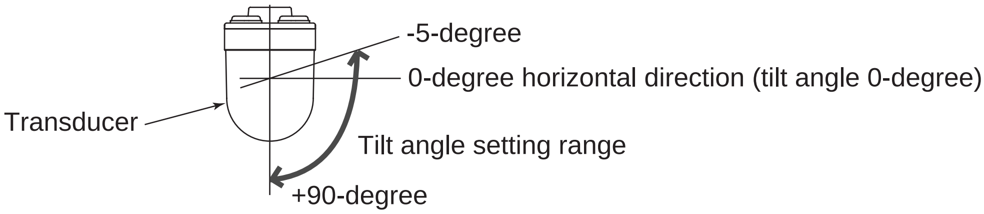
4.4 Tilt Angle

The tilt angle shows the direction to which the sound wave is emitted. When the sound wave is emitted horizontally, the tilt angle is said to be 0° and when vertically, 90°. The tilt angle can be set between –5°(upward) to 90° (downward), in increments of 1°. The tilt angles for horizontal 1 and horizontal 2 modes can be set independently of one another. For further details, see section 4.4.4 and 4.4.5.

4.4.1 Setting the tilt angle

To manually set a tilt angle, operate the [TILT] control. Watch the tilt angle indication and tilt angle indicator at the top right corner of the screen.

Select tilt angle depending on target fish. For surface fish select a shallow angle (about 5°) and for bottom fish, a deep angle.



4.4.2 Automatic tilt

The [AUTO TILT] key automatically scans the tilt angle within the selected width. This is useful when you want to find the center depth of a fish school.

1. Press the [AUTO TILT] key to select auto tilt angle desired. Each time the [AUTO TILT] key is pressed the auto tilt angle changes in the following sequence.

   → OFF → [±1 - 4°] → [±2 - 6°] → [±3 - 8°] (Narrow)

   → OFF → [±2 - 10°] → [±4 - 16°] → [±6 - 20°] (Wide)

Automatic tilt range (narrow) with AUTO TILT key

Range	Width (1)	Width (2)	Width (3)	Period
60, 100	±4°*	±6°*	±8°*	Period: One trans.
150, 200	±2°	±4°*	±6°*	Tilt angle changes
300, 400	±1°	±2°	±4°*	in 2° increments for
500, 600	As above	As above	±3°	asterisk-marked
700, 800	As above	As above	As above	width;
900, 1000	As above	As above	As above	1° increments for
1100 and more	As above	As above	As above	all other widths.

Automatic tilt range (wide) with AUTO TILT key

Range	Width (1)	Width (2)	Width (3)	Period
60, 100	±10°	±16°	±20°*	Period: One trans.
150, 200	As above	As above	As above	Period: Four trans.
300, 400	As above	As above	As above	Period: Two trans.
500, 600	±8°	As above	As above	Same as above
700, 800	±6°	±12°	±16°	Same as above
900, 1000	±4°	±8°	±12°	Same as above
1100 and more	±2°	±4°	±6°	Same as above

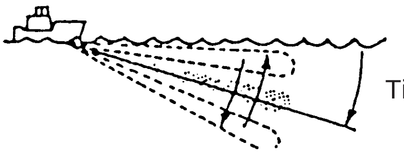
   * For the H1/S combination display, two transmissions/period at depth between 60 and 200 m and one transmission/period for range 300 m or greater.

   Note: Wide tilt angle is activated from the SYSTEM menu. For further details, contact your dealer.

2. Auto tilt begins, with the tilt angle set with the [TILT] control as the center tilt angle.
3. If necessary, change center tilt angle with the [TILT] control.

For example, when the [RANGE] control, [TILT] control and [AUTO TILT] key are set to 800 m, 8° and width (1) respectively, the tilt angle changes at each transmission as follows:

8°→9°→8°→7°→8°



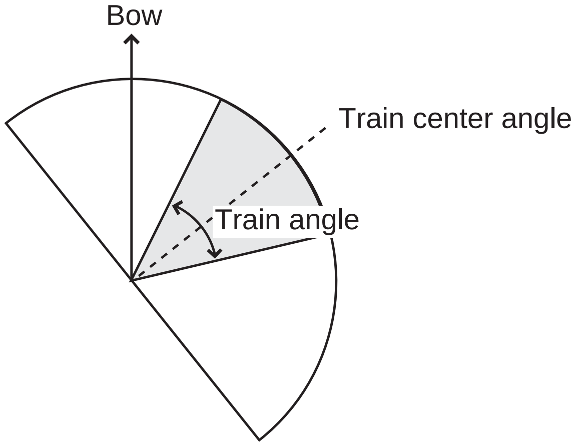
Auto tilt concept

Note: The [AUTO TILT] key is inoperative when the target lock function is active or is made active. Once the target lock is turned off auto tilt operation is resumed.

4.5 Auto Training

This feature provide automatic training of the Tx and Rx beams in left and right directions to enable search over a wide area.

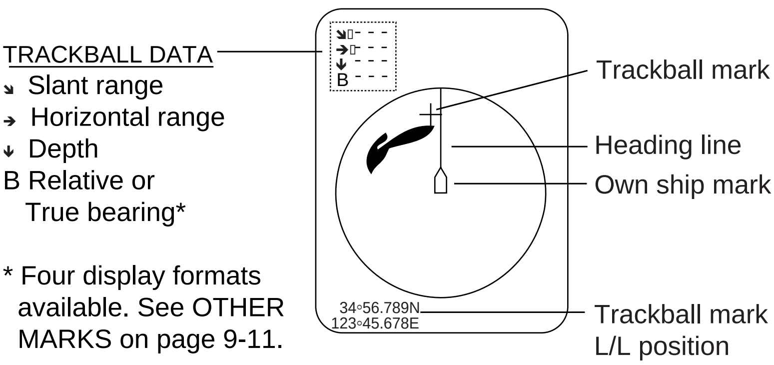
1. Press the [V1/S] or [V2] key to set center angle for automatic training.
   Each press of those keys displays center angle for automatic training at the center of the screen.. Operate [V1/S] to change training rightward; [V2] to change training leftward.
2. While pressing the [AUTO TRAIN] key press the [V1/S] key to set train angle. The choices are ±30°, ±90°, ±120° and OFF..



Auto train is automatically cancelled when target lock is activated, and the train angle is set where the target lock mark is entered. When target lock is disabled, auto train resumes from the bearing in use at the time of deactivation of target lock. Auto train cannot be activated if target lock is currently active.

4.6 Measuring Range and Bearing to a Target

Operate the trackball to place the trackball mark on the target you want to measure the range and bearing. The range, bearing and depth to the target appear at the upper left corner of the screen.

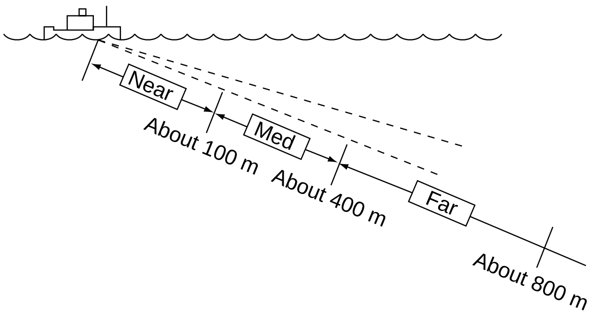


Location of trackball data

4.7 Eliminating Weak Echoes

Echoes from targets such as bottom and fish return to the transducer in order of distance to them, and when we compare their intensities at the transducer face, those from nearer targets are generally stronger when their reflecting properties are nearly equal. The sonar operator will be quite inconvenienced if these echoes are directly displayed on the screen, since he cannot judge the actual size of the target from the size of echoes displayed on the screen. To overcome this inconvenience, use the TVG function. It compensates for propagation loss of sound in water; amplification of echoes on short range is suppressed and gradually increased as range increases so that similar targets are displayed in the similar intensities irrespective of the ranges to them.

The FSV-84 has three TVG functions, NEAR, MEDIUM and FAR, and they mainly compensate for propagation loss on short, middle and long ranges respectively, centered at the ranges shown below. The higher the TVG setting the greater the amplification of echoes.

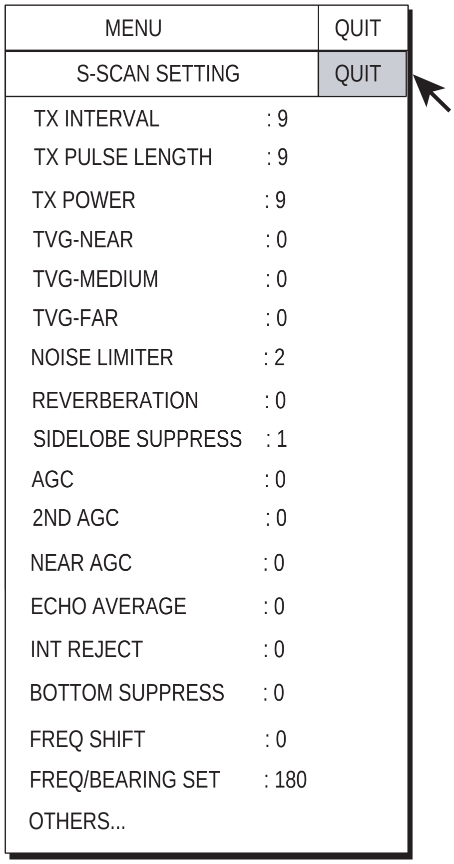


Note: TVG distances can be adjusted from the menu.
See page 4-43.

Principle of TVG

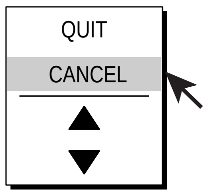
The TVG is also used to suppress unwanted echoes and noise which appear in a certain range area on the screen such as sea surface reflections and cruising noise. To set TVG properly, do the following:

1. Press the [MENU] key to open the main menu.
2. Select S-SCAN SETTING with the trackball and press the [MENU] key to open the S-SCAN SETTING menu.



S-SCAN SETTING menu

3. Select TVG-NEAR with the trackball and press the [MENU] key to show the dialog box.



Numeric data entry dialog box

4. Use the trackball to select ▲ or ▼ and press the [MENU] key to set. The setting range is –5 to 5. The higher the setting the greater the TVG effect.
5. Select QUIT and press the [MENU] key.
6. Repeat steps 3-5 to set TVG-MEDIUM and TVG-FAR.
   When sea surface reflections or plankton layers disturb the picture, decrease appropriate TVG option by one or two steps.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: When a fish school is located on a long-range setting (about 800 meters) and is approaching own ship do as follows:

Adjust the tilt to keep the fish school in the center of the sonar beam, namely, fish school is displayed in strongest colors possible. Confirm that the fish echo is displayed in the same color as it approaches. If the color suddenly changes to weaker colors as the fish enters MEDIUM and NEAR areas, the TVG is improperly set. Adjust the TVG. If this again produces sea surface reflections and noise try to remove them with the AGC and noise limiter.

If the above procedure does not produce satisfactory results, the TVG curve can be changed on the OTHERS sub menu in the H-SCAN SETTING menu. Also, adjust the setting of NEAR AGC, referring to next section.

4.8 Suppressing Bottom Tail

4.8.1 Adjust AGC

The AGC functions to automatically reduce the receiver gain only against strong echoes such as the bottom or a large fish school. Since weak echoes remain unaffected, a small fish school becomes easier to detect. Adjust it so that the AGC works only on bottom reflections. Do not set it too high; weak echoes may be missed.

1. Press the [MENU] key to open the menu.
2. Select S-SCAN SETTING menu and press the [MENU] key.
3. Select AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.8.2 Decrease pulse length

The pulse length determines the length of the transmission pulse emitted into the water. While a longer pulse is advantageous for long-range sounding, it has the disadvantage of being poor in discrimination of targets, that is, the ability to separate several closely located targets. When searching bottom fish, therefore, it is useful to shorten the pulse length in order to separate fish echoes from bottom reflections. Decrease the pulse length setting to shorten the pulse length. For search of surface and midwater fish in which bottom reflections are not so strong, use the longest pulse length “9”.

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select TX PULSE LENGTH and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the longer the pulse length.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.8.3 Adjust 2nd AGC

While it is ideal to suppress bottom echoes with the AGC alone there are some fishing grounds where this is not possible. (The high power sonar has the advantage of long-range detection but this can also be a disadvantage, since weaker echoes may be hidden in strong, unwanted echoes such as the bottom.) If you cannot suppress bottom echoes or sea surface reflections by the AGC function alone, use the 2nd AGC feature. Normally a setting of 1 or 2 is suitable. For especially strong echoes, use a setting of 3 or 4.

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select 2nd AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-12. The higher the setting the greater the suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.8.4 Adjust Near AGC

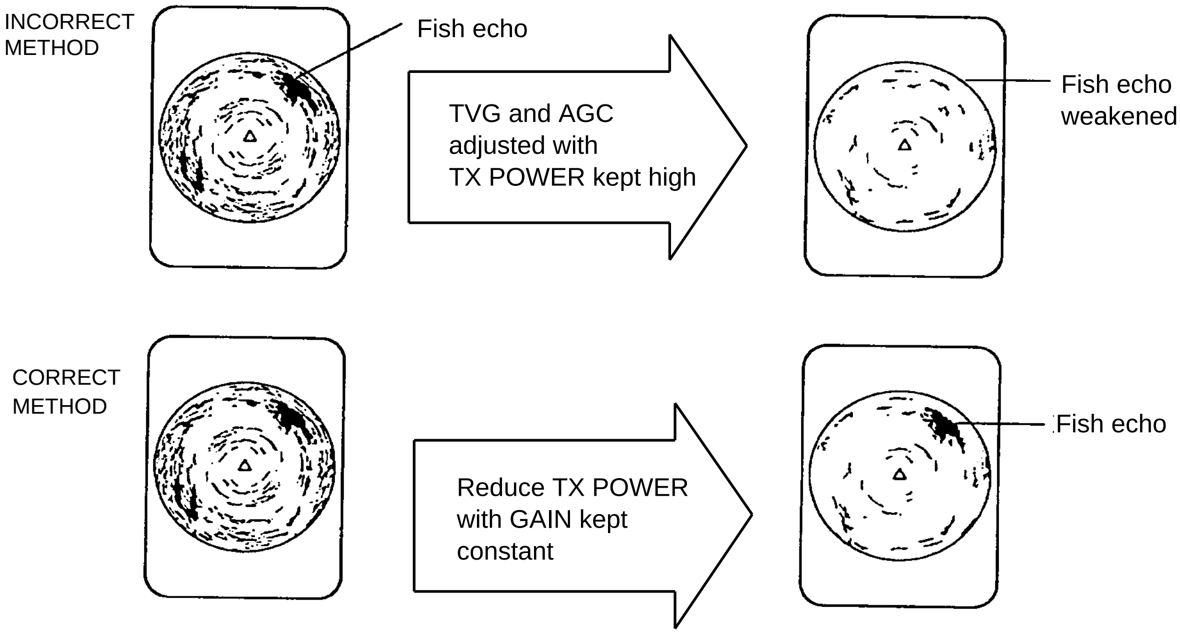
When an excessively strong echo is received in shallow or heavily sedimented waters, you may not be able to suppress it by the TVG control alone. In this case, a fish school which is displayed at more than 300 m away may disappear gradually when the ship is approaching the fish school.

Use the Near TVG feature to suppress this strong echo. Normally set it between 3 and 4, however, this setting depends on the sea area. Do not set it too high; all echoes (including noise) from near distance may be painted in red.

1. Press the [MENU] key to open the menu.
2. Select S-SCAN SETTING menu and press the [MENU] key.
3. Select NEAR AGC and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-10. The higher the setting the greater the echo level of near distance.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.9 Suppressing Bottom and Sea Surface Reflections in Shallow Waters

In shallow fishing grounds with hard or rocky bottom, bottom reflections often interfere with wanted fish echoes and they can not be eliminated sufficiently with the aforementioned TVG and AGC functions, especially when the TILT is set to a larger angle in order to track fish schools approaching within 400 m. In such cases try to reduce the output power by adjusting the Tx output instead of turning down the gain. The picture becomes clearer when output power is reduced rather than when the GAIN is decreased as illustrated below.



How to suppress bottom and sea surface reflections in shallow waters

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select TX POWER and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the higher the Tx power.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.10 Rejecting Sonar Interference and Noise

While observing the sonar picture, you may encounter occasional or intermittent noise and interference. These are mostly caused by on-board electronic equipment, engine or propeller noise, or electrical noise from other sonars being operated nearby.

4.10.1 Identifying noise source

To eliminate noise effectively, you should first identify the noise source as follows:

1. Stop transmission on the TEST menu, by turning on “TX” in the TEST menu, and turn on the power of all on-board equipment one by one while observing the picture. If noise appears on the sonar display, that equipment is emitting noise. Check the offending equipment’s ground and installation.
2. Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above two steps has effect on the picture, adjust one of the following:

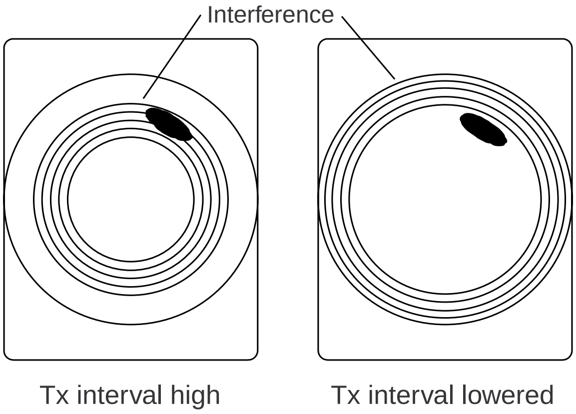
4.10.2 Interference rejector

This control is similar to the interference rejector on echo sounders and radars. It is effective for rejecting random noise and sea surface reflections in rough sea conditions. Set it so that noise is just eliminated. Do not use an unnecessarily high setting since it may also reject small wanted echoes.

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select INT REJECT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-3. The higher the setting the greater the degree of interference rejection.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.10.3 Changing Tx interval

When other sonars nearby are operating the same transmission interval as that of own ship's sonar, an interference ring appears on the display. To erase the interference ring from the screen, reduce the TX INTERVAL on the H-SCAN SETTING menu.



How TX INTERVAL works

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select TX INTERVAL and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-9. The higher the setting the longer the Tx interval. The setting 0 is same as the setting 9.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: When the sonar is used in shallow water with the range set between 60 m and 200 m and Tx cycle at "9", bottom reflections caused by the 2nd-to-the-last transmission may appear on near ranges. Lower the Tx interval by 2 or 3 steps to suppress them.

4.1.0.4 Shifting Tx frequency

If interference cannot be suppressed by the interference rejector or Tx interval, shift the Tx frequency with FREQ SHIFT on the H-SCAN SETTING menu.

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key.
3. Select FREQ SHIFT and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is -65 to +65.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.10.5 Noise limiter

Weak, unwanted reflections, colored light-blue or green, appear when the water is dirty, plankton layers exists, or due to ship's noise. The noise limiter can reduce the effects of these unwanted reflections. Raising the setting causes unwanted reflections to be displayed in colors of blue to background color. Normally a setting of 3 or 4 is sufficient.

1. Press the [MENU] key to open the menu.
2. Select the S-SCAN SETTING menu and press the [MENU] key
3. Select NOISE LIMITER and press the [MENU] key.
4. Adjust setting from the dialog box as appropriate and press the [MENU] key. The setting range is 0-15. The higher the setting the greater the degree of suppression.
5. Select QUIT and press the [MENU] key.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.10.6 Echo average

Adjusts echo afterglow, which can be useful for watching echo movement in the S-SCAN SETTING menu. The setting range is 0-7. The higher the number the longer echoes remain on the screen.

4.10.7 Reverberation reduction

You may choose the length of reverberation for the echo signal in the S-SCAN SETTING menu. The larger the value the shorter the reverberation, which makes it easer to see the echo signal. The setting range is 0-3.

4.10.8 Suppressing gain of bottom echo

None-moving echoes such as bottom echo, plankton echo, etc., may be suppressed by the setting of BOTTOM SUPPRESS in the H-SCAN SETTING menu (moving echoes such as fish school are not effected by this setting). The setting range is 0 to 10. The greater the setting, the greater the suppression level of the bottom, etc.

Note: Too high a setting may suppress slow-moving fish school as well.

4.10.9 Suppressing sidelobes

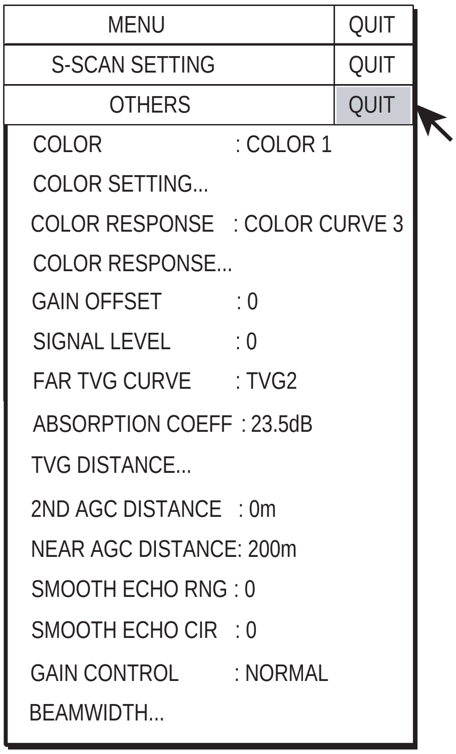
Sidelobes are fairly emissions generated outside the main beam. The energy of the sidelobe is fairly weak but when the water is comparatively shallow and the bottom is rocky and hard, strong signals are detected by the sidelobe.

To reduce the effect of sidelobes, adjust SIDELOBE SUPPRESS from the S-SCAN SETTING menu. The setting range is –3 to +3 and the default setting is 0. The higher the setting the greater the sidelobe suppression. If there is a difference between the port and starboard side images, use a minus setting.

4.11 Adjusting Beamwidth

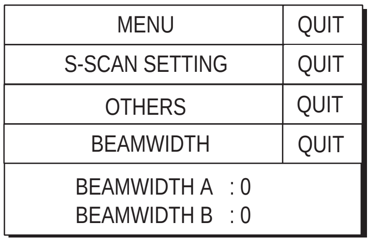
The horizontal beamwidth of the Rx beam can be adjusted at the OTHERS menu as below to raise the horizontal resolution.

1. Press the [MENU] key to open the menu.
2. Select S-SCAN SETTING and press the [MENU] key.
3. Select OTHERS and press the [MENU] key.



.OTHERS menu

4. Select BEAMWIDTH and press the [MENU] key to open the dialog box.



Numeric data entry dialog box

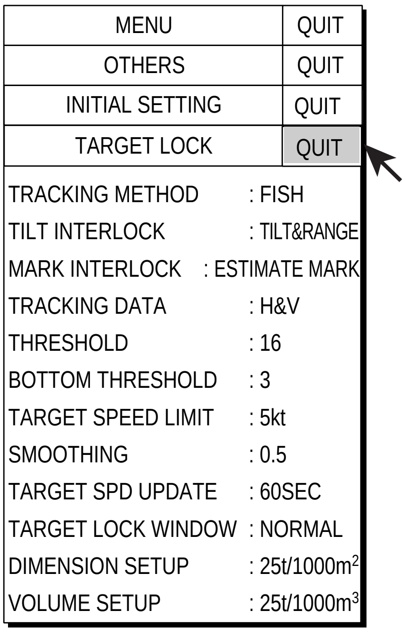
5. Select BEAMWIDTH A and set appropriate value. The higher the setting the sharper the horizontal resolution. The setting range is -4 to 5 plus AR and the default setting is 0. AR means AUTO RANGE and it automatically adjusts horizontal beamwidth according to the range.
6. Select BEAMWIDTH B and set appropriate value. This controls echo beam width by echo processing. The setting range is 0-5, and the higher the setting the greater the horizontal resolution.
7. Select QUIT and press the [MENU] key.
8. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.12 Tracking a Fish School (target lock)

The target lock function automatically tracks a fish school so you won't lose sight of it on the display. Two types of target lock are available: position tracking (TARGET MARK) and fish school tracking (FISH) and you may select one from the menu as below. Default setting is "FISH." However, if the FSV-84 cannot receive an echo of sufficient level of echo, tracking may not be performed.

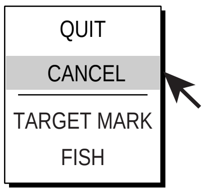
4.12.1 Selecting target lock type

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select INITITAL SETTING and press the [MENU] key.
4. Select YES and press the [MENU] key to confirm the CAUTION indicated.
5. Select TARGET LOCK and press the [MENU] key.



TARGET LOCK menu

6. Select TRACKING METHOD and press the [MENU] key to open the dialog box.



Target lock type dialog box

7. Use the trackball to select TARGET MARK or FISH as appropriate and press the [MENU] key.
8. Select QUIT and press the [MENU] key.
9. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

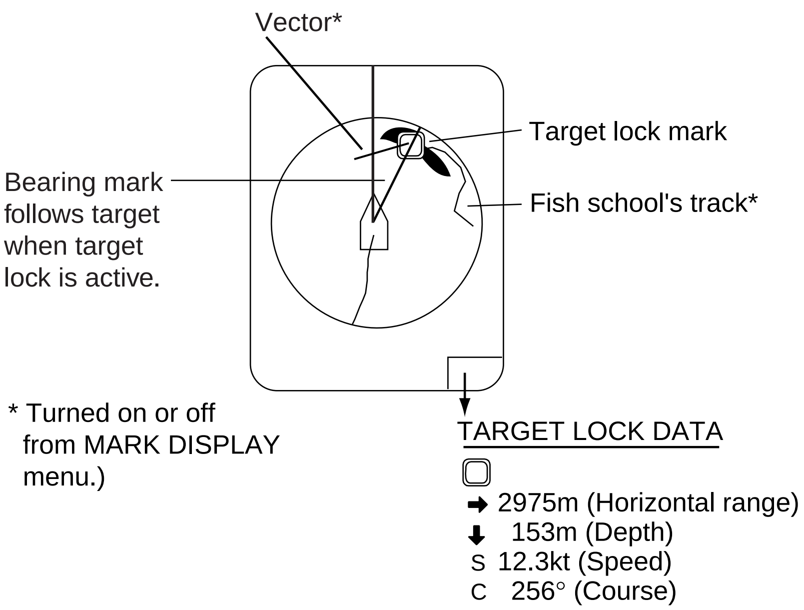
4.12.2 Fish school tracking mode

The automatic echo target lock function automatically tracks the operator-selected fish school. When menu option TILT INTERLOCK on the TARGET LOCK menu (previous page) is set to TILT & RANGE, and the tracked fish school goes out of the zone in the range direction, the range and tilt are automatically controlled according to the fish school position.

1. Select FISH at step 7 in the procedure in section 4.12.1.
2. Use the trackball to select the fish school to track on the slant display.
3. Press the [TARGET LOCK] key.

   The target lock mark appears (▢) on the fish school with a vector extending from its edge. This vector shows estimated target position after elapsed of preset vector time. The target lock mark is also inscribed on the vertical display, however no vector appears.

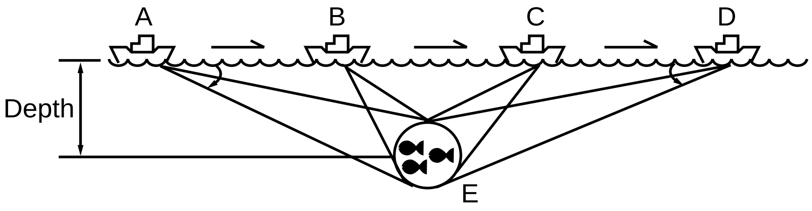
   - If the target is lost, the target lock mark changes to red color and the tracking mode changes to position mode (see next section) at that position.
   - When the FSV-84 detects and tracks the target again, the mode returns to the fish school mode.
4. To turn off the target lock, press the [TARGET LOCK] key again.



Target lock mark and target lock data

4.12.3 Position tracking mode

This mode tracks a stationary position (such as a reef) using position data fed from a navigator.

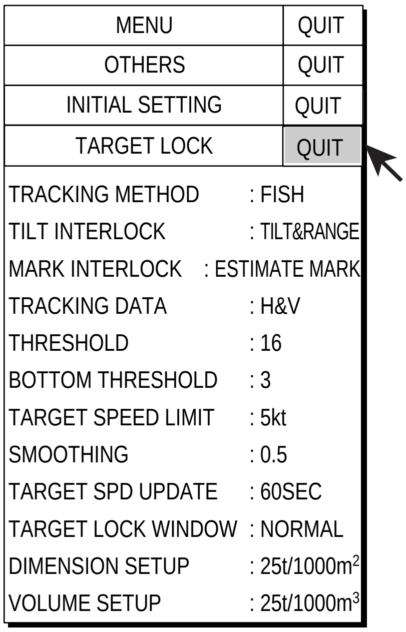


How position tracking mode target lock works

1. Select TARGET MARK at step 7 in the procedure in section 4.12.1.
2. Use the trackball to select the location to track.
3. Press the [TARGET LOCK] key to inscribe the target lock mark (▢) at the location selected. The target lock mark is also inscribed on the vertical display.

Tilt, range and vertical bearing are automatically adjusted to track the location. Using the figure above as an example, the target lock mark is placed on location “E”. Then, the equipment remembers the location of “E” and automatically changes the tilt angle as the ship moves from position A through D. As long as the fish school “E” is stationary its echo is kept displayed on the screen.

4.12.4 TARGET LOCK menu



TARGET LOCK menu

TRACKING METHOD: Selects tracking method, target mark (position) or fish.

TILT INTERLOCK: Provides automatic change of tilt angle and range or tilt angle during target lock.

MARK INTERLOCK: Selects items of numeric/graphic data display during target lock operation.

TRACKING DATA: Selects which tracking data to use; horizontal, or both horizontal and vertical.

THRESHOLD: Selects the weakest echo color number to track. The setting range is 1 to 30.

BOTTOM THRESHOLD: When a target is judged as a bottom echo, raise this setting to differentiate bottom from target. The setting range is 0 to 5.

TARGET SPEED LIMIT: Sets maximum fish speed to track. The setting range is 1kt to 15kt.

SMOOTHING: Sets smoothing rate for fish speed data. The setting range is 0.0 to 1.0.

TARGET SPD UPDATE: Sets fish speed data update interval among 15, 30, 45 and 60 seconds.

TARGET LOCK WINDOW: Selects size of target lock detection area; normal, large, largest. However, this area is not displayed on the screen.

DIMENSION SETUP: Sets dimension constant for calculation of fish school tonnage from the fish school dimension.

VOLUME SETUP: Sets volume constant for calculation fish school tonnage from fish school volume.

4.13 Detecting Fish Schools Aurally

Sometimes you may be preoccupied with other tasks and unable to concentrate on watching the sonar picture. In such cases it would be a good choice to use the audio function. This function enables you to monitor echoes from fish schools and seabed through the built-in speaker.

After you've become accustomed to monitoring fish aurally, you should be able to detect a fish school from a range longer than you can detect it on the screen. In addition you may judge whether the fish school is approaching or going away; the tone becomes higher when the school is approaching and lowers when the school is going away.

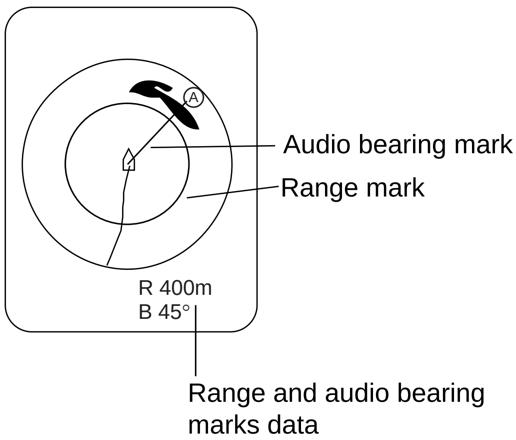
4.13.1 Selecting direction

In the default setting, the audio function is on and the audio sector is 30°.

1. Operate the trackball to place the trackball mark on the direction you want to monitor through the speaker.
2. Press the [R/B AUDIO] key.

The audio bearing mark appears on the bearing selected, in a 30°, 60°, 90°, 180° or 330° sector centering the audio bearing mark. Echoes are monitored through the speaker. You can adjust speaker volume with the [AUDIO] control.

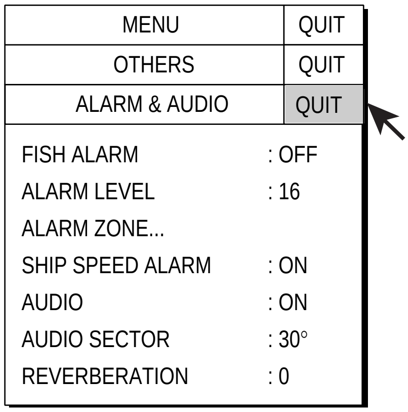
Note: When the trackball mark is placed near own ship mark and the [R/B AUDIO] key is pressed, the range mark and the related data at the bottom of the screen are erased. Note that the audio bearing is erased when "AUDIO" on the ALARM & AUDIO menu is turned off.



Range and audio bearing marks

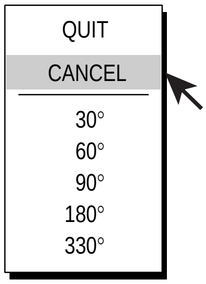
4.13.2 Selecting audio sector

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ALARM & AUDIO and press the [MENU] key.



ALARM & AUDIO menu

4. Select AUDIO SECTOR and press the [MENU] key to open the dialog box.



Audio sector dialog box

5. Select desired audio sector among 30°, 60°, 90°, 180°, 330° and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.13.3 Reverberation

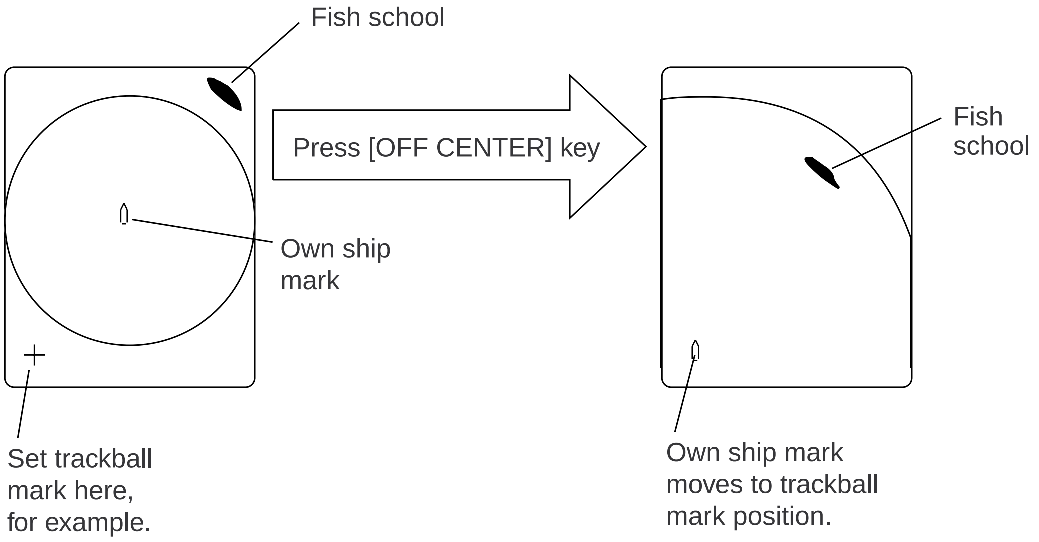
You may choose the length of reverberation for the audio signal. The larger the value the longer the reverberation, which makes it easer to hear the audio signal. The setting range is 0-9 and the default setting is 0.

4.14 Offcenter

4.14.1 Manual offcenter

The manual offcenter feature is useful for relocating fish school on the display.

1. Operate the trackball to place the trackball mark on the position where you want to relocate the own ship mark.
2. Press the [OFF CENTER] key.
3. To move the own ship mark back to the screen center, press the [OFF CENTER] key again.

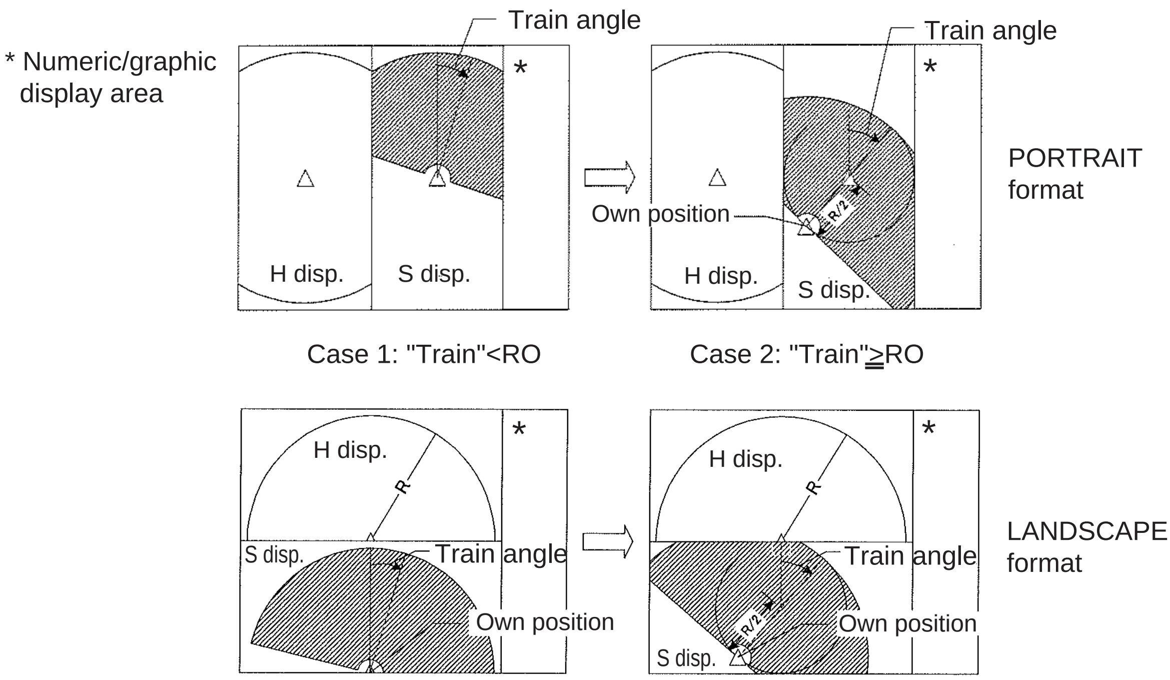


How to use offcenter

4.14.2 Automatic offcenter

The slant mode display in the slant mode combination display (portrait or landscape) can be automatically off centered when the train is changed while using auto train or target lock or the user changes the train angle manually. This is useful to maintain effective range ratio at 1.0.

To activate this feature it is necessary to activate automatic offcenter from the menu.



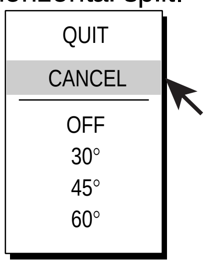
Case 1: "Train"<RO Case 2: "Train"≧RO

Train angle: Angle in automatic training, set with the]V1/S] or [V2] key.
R0: Train angle (30°, 45°, 60°) set on menu.

Automatic offcentering is available regardless whether the train angle setting value is the same or larger than actual train angle.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.
4. Select S AUTO OFF CENTER and press the [MENU] key.

   The S AUTO OFF CENTER is only operative when the slant combination display is active in vertical or horizontal split.

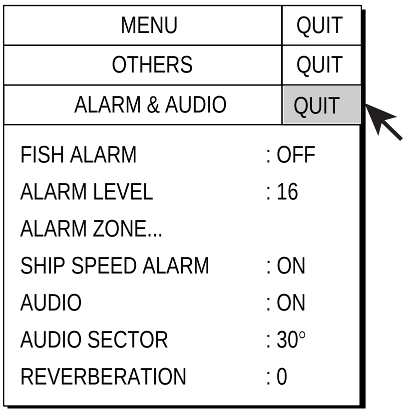


5. Choose value desired and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT from the top of the menu and press the [MENU] key.

4.15 Fish Alarm

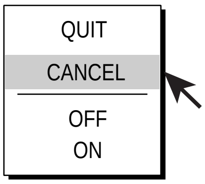
The fish alarm sounds the aural alarm when a fish echo above a preset strength enters the operator-set alarm zone.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ALARM & AUDIO and press the [MENU] key.



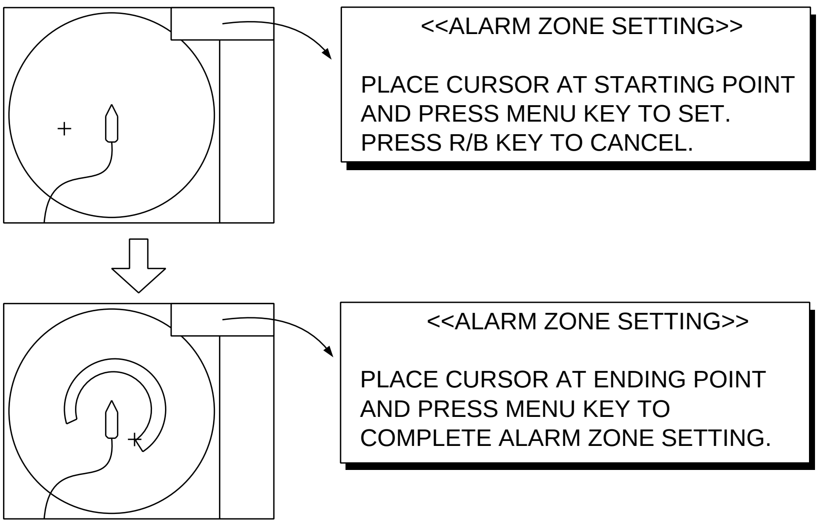
ALARM & AUDIO menu

4. Select FISH ALARM and press the [MENU] key to open the dialog box.



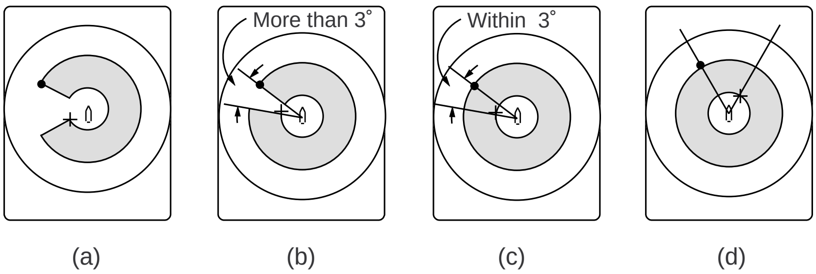
Fish alarm status dialog box

5. Select ON, select QUIT and then press the [MENU] key. To cancel the fish alarm, select OFF instead of ON.
6. Select ALARM ZONE and press the [MENU] key.
7. Operate the trackball to place the trackball mark on the starting point of the alarm zone.
8. Press the [MENU] key.
9. Rotate the trackball clockwise to select the ending point. The display paints a fan-shaped alarm zone.
10. Press the [MENU] key.
11. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.



How to set the fish alarm zone

Note 1: There must be at least three degrees difference between the starting and ending points to get a fan-shaped alarm zone as shown in (a) and (b) below. Otherwise, the unit paints a 360-degree alarm zone as in (c) where there is less than 3 degrees between the starting and ending points and (d) where the bearing marker has been rotated one full turn.



How to create desired alarm zone

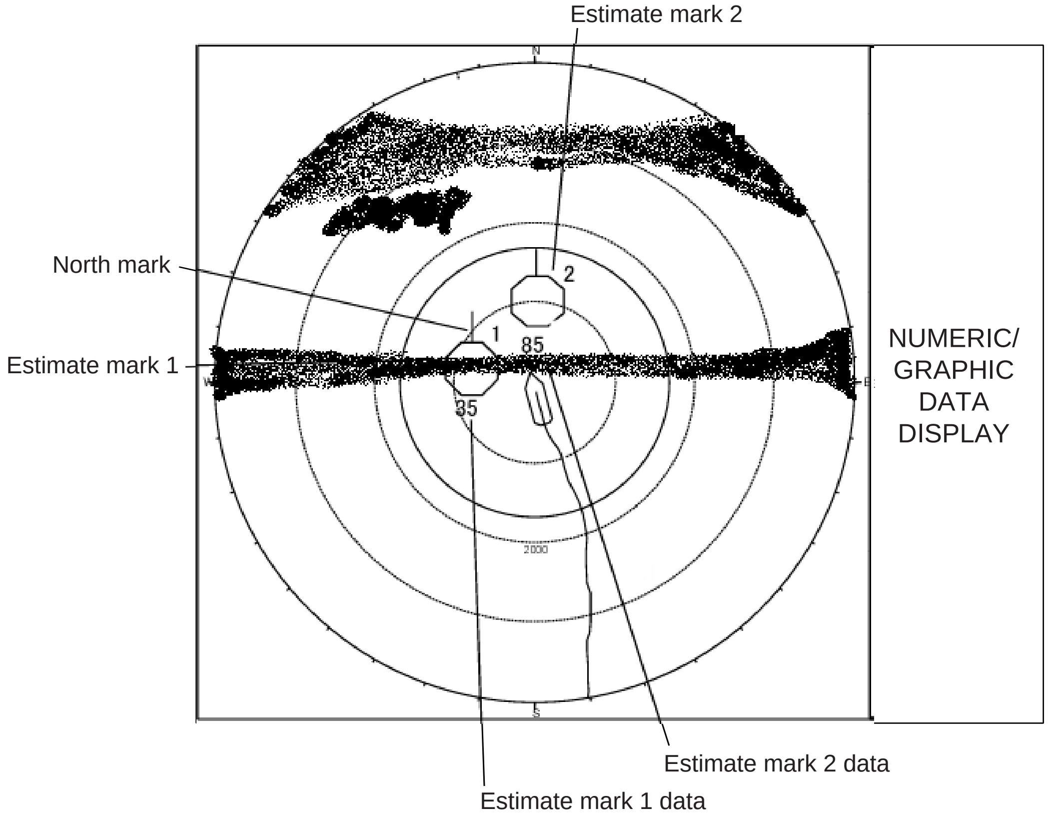
Note 2: The echo strength which triggers the alarm can be set with ALARM LEVEL on the ALARM & AUDIO menu. The setting range is 0-30.
This value corresponds with the number of 32-echo colors.

Note 3: To disable the fish alarm, choose OFF at step 5 in the procedure on the previous page.

4.16 Comparing Fish School Concentration

You can get an estimate of the volume of two fish schools by using the two ESTIMATE keys as follows:

1. Operate the trackball to place the trackball mark on a fish school, and then press the [ESTIMATE 1] key.
2. The estimate mark appears on the fish school. Relative volume is shown by a figure between 0 and 100, below the estimate mark. When the area inside the mark is filled in reddish brown, volume figure is said to be “100”.
3. Operate the trackball to place the trackball mark on another fish school and press the [ESTIMATE 2] key.
4. Compare estimate figures for each fish school by observing estimate mark data and the fish histogram.
5. To turn off the estimate marks press their respective keys.



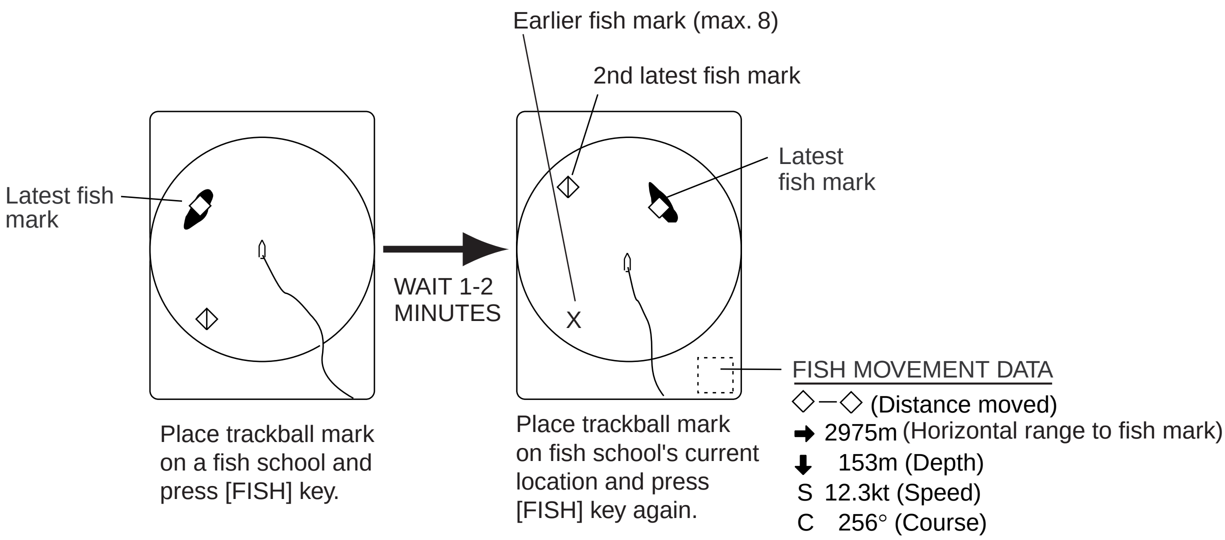
Estimate marks and their data

4.17 Measuring Fish School Speed

To ensure a good haul, it is important to estimate the direction and speed of the fish school before shooting the net. You can do this with the [FISH] key. With tidal current data plus fish speed data, you can determine the timing of the net shooting more efficiently. This function requires speed and heading data.

4.17.1 Entering fish marks

1. Place the trackball mark on the center of a fish school, and then press the [FISH] key. The latest fish mark (◇) appears on the fish school.
2. Wait 1 to 2 minutes.
3. Place the trackball mark on the same fish school selected in step 1 and press the [FISH] key. The latest fish mark appears on the target, the 2nd latest fish mark (◇) appears on the location selected at step 1 and any earlier fish marks are shown with an “X”. The distance between the two fish marks and fish school course and speed appear at the bottom right-hand corner of the horizontal display area.

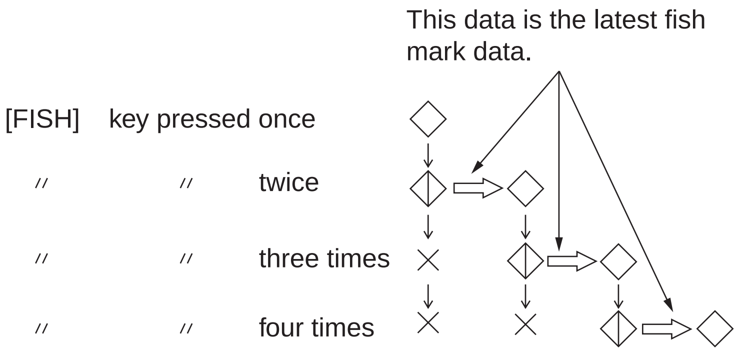


How to measure fish school speed

Note 1: Fish movement is calculated using ship’s speed and heading data. Accordingly, pitching and rolling may affect the calculation. For best results, try the procedure two or three times to verify reliability.

Note 2: The time and distance between pressings of the [FISH] key should be as long as possible to increase accuracy of measurement. For best results, repeat the procedure two or three times.

Note 3: Each time the [FISH] key is pressed the latest fish mark and ship's speed mark change in the sequence shown below.



Fish mark

4.17.2 Deleting fish marks

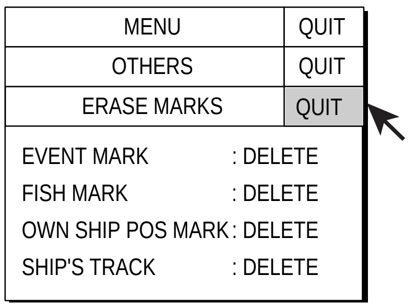
Fish marks can be deleted individually with the [DELETE MARK] key or by earliest entry through the menu. Note that the [DELETE MARK] key also erases event marks.

<u>Deleting fish marks with the [DELETE MARK] key</u>

Use the trackball to place the trackball mark on the fish mark you want to erase. The color of the fish mark changes from white to red when the fish mark is correctly selected. Press the [DELETE MARK] key to delete the fish mark.

<u>Deleting fish marks through the menu</u>

1. Press the [MENU] key to show the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ERASE MARKS and press the [MENU] key.



ERASE MARKS menu

4. Select FISH MARK and press the [MENU] key. Each press of the [MENU] key deletes the earliest fish mark.
5. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

4.18 Event Mark, Own Ship Position Mark

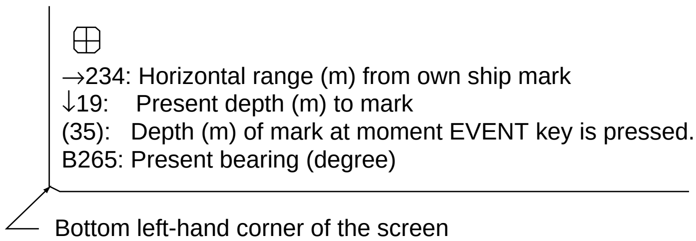
The event mark is useful for finding the horizontal range, depth and bearing to a location some distance from current position. 10 such marks may be inscribed on the horizontal display. This function requires speed and heading data.

There are two types of event marks, latest event mark (⊕) and event mark (+). Each time an event mark is entered the latest event mark appears at the trackball mark position and all other event marks are shown by the “plus” (+) mark and numbered in sequential order. When the memory capacity for event marks is reached the earliest event mark is automatically erased to make room for the latest.

The own ship position mark (△) is used to mark current position.

4.18.1 Entering an event mark

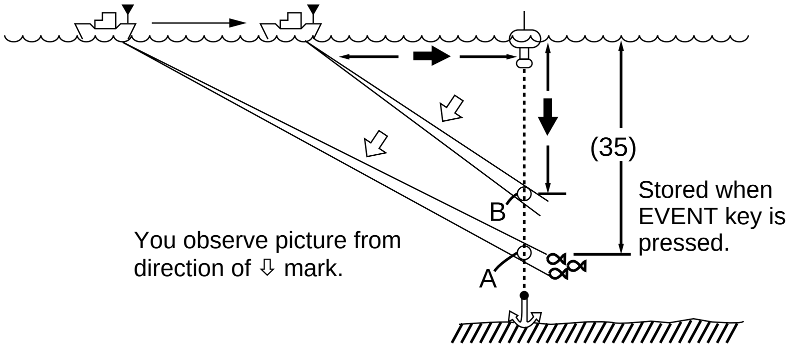
1. Set the trackball mark where you want to place an event mark.
2. Press the [EVENT] key. The horizontal range, depth and bearing to the event mark appear at the bottom left corner of the horizontal display area.



Event mark data

With speed and heading data the mark follows own ship’s movements. In the True Motion mode, the event mark is stationary. When the tilt angle is changed mark position changes with slant range. Note however that the mark’s position does not change when automatic tilt is active; the tilt center angle is used to position the mark.

Plotting an event mark on the display is equivalent to dropping a buoy with an anchoring chain that extends from surface to bottom. The buoy is fixed at its geographical location, but the marker on the display moves to a point where present beam plane intersects the anchor chain of the buoy as ship moves or the tilt angle is changed. This can be said about marks as well such as fish mark and trackball mark.



Event mark description

4.18.2 Entering an own ship position mark

Place the trackball mark close to the center of the own ship mark and press the [EVENT] key. Ten own ship position marks may be inscribed. When the capacity for own ship position marks is reached the earliest own ship position mark is automatically erased.

4.18.3 Deleting an event mark, own ship position mark

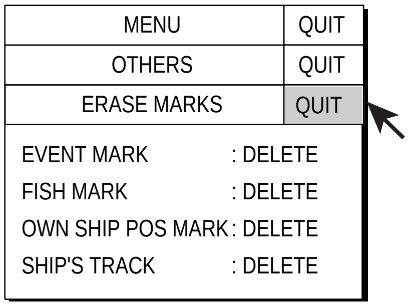
Event marks and own ship position marks can be deleted individually with the [DELETE MARK] key or by earliest entry through the menu.

Deleting event marks, own ship position mark with the [DELETE MARK] key

Use the trackball to place the trackball mark on the event mark or own ship position mark you want to erase. The color of the mark changes from white to red when the mark is correctly selected. Press the [DELETE MARK] key to delete the mark.

Deleting event marks, own ship position mark through the menu

1. Press the [MENU] key to show the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ERASE MARKS and press the [MENU] key.



ERASE MARKS menu

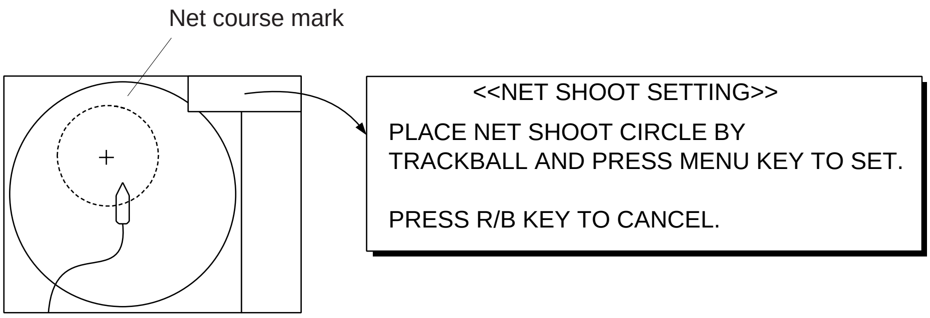
4. Select EVENT MARK (or OWN SHIP POS MARK) and press the [MENU] key. Each pressing deletes the earliest event mark (or own ship position mark).
5. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

4.19 Net Course Mark

Before shooting the net, decide the shoot timing considering tide direction, distance to the fish school and moving direction of the fish school. Use the net course mark as a guide to decide the timing. This function requires speed and heading data.

Inscribing the net course mark

1. Press the [MENU] key to open the main menu.
2. Select OTHERS and press the [MENU] key to open the OTHERS menu.
3. Select DISPLAY SETTING and press the [MENU] key to open the DISPLAY SETTING menu.
4. Select NET COURSE MARK and press the [MENU] key. Instructions for setting the net course mark appear on the display.



Net course mark

5. Use the trackball to position the net course mark, which is shown by a dashed circle.
6. Press the [MENU] key to set, and the dashed circle changes to a solid one.
7. Select QUIT at the top of the menu screen and press the [MENU] key to quit all menus.

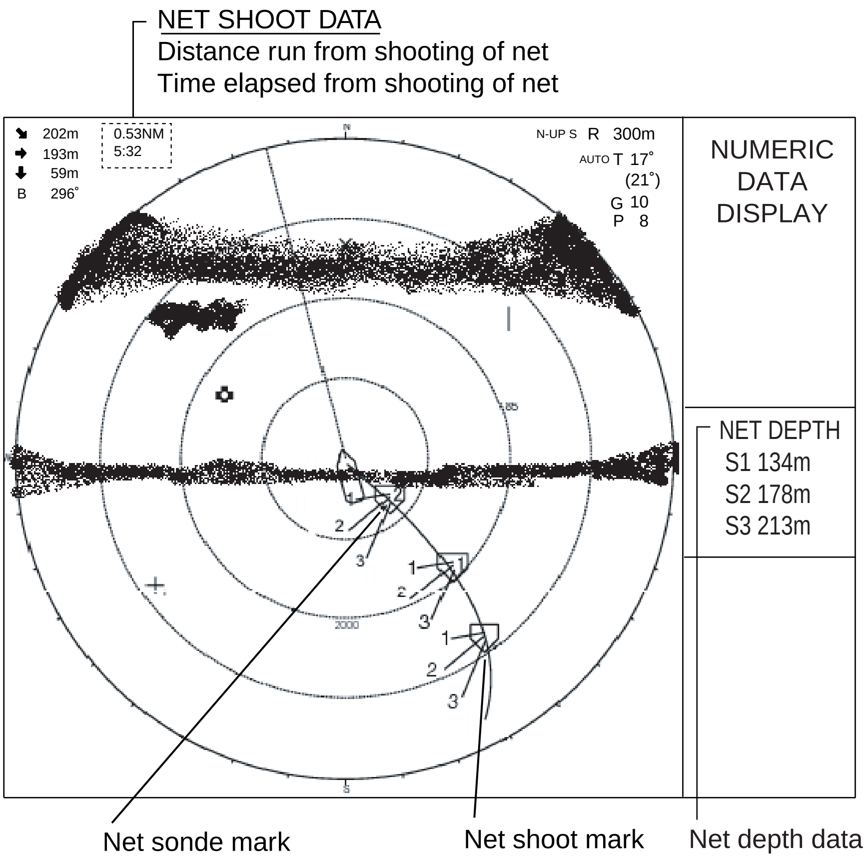
* To delete the net course mark, repeat the above procedure.

4.20 Observing Net Behavior

With net sonde connection you can observe net behavior after the throwing of the net. Accurate depiction of net sonde position depends on proper setting of the distances between net sonde transmitters. You can set those distances on the OTHERS - INITIAL SETTING - NET SONDE SETTNG menu.

This function requires speed and heading data.

1. Press the [SHOOT] key just upon throwing the net into the water. The following actions occur:
   - Net shoot mark ( ) appears at own ship position.
   - Net shoot data appears.
   - Net sonde mark is inscribed.
   - Net depth data is displayed.
   - Water depth data and water temperature data erased from own ship's track.
   - In an ES combination mode, tide data and net depth replace the water temperature graph.
   - In an ES combination mode, the picture advance method changes to "speed sync."
   - In an ES combination mode, the picture advance width appears on the ES display.
2. To erase the net sonde mark and associated data, press the [SHOOT] key again.



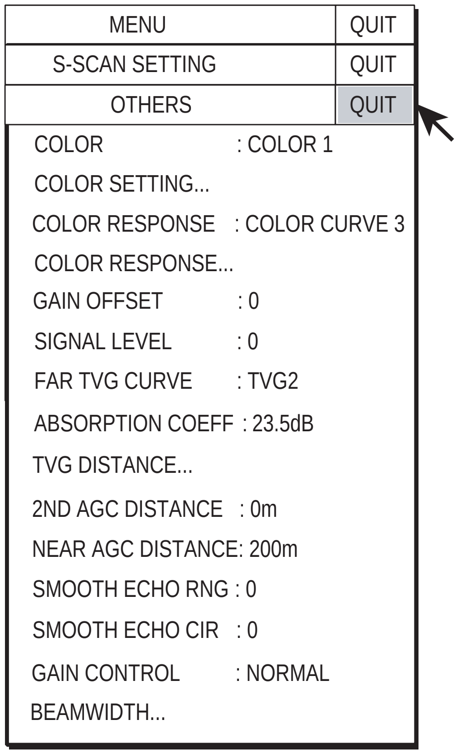
Net behavior

4.21 OTHERS Menu

This section presents an overview of the OTHERS menu on the H-SCAN SETTING menu.

4.21.1 Displaying the OTHERS menu

1. Press the [MENU] key to open the menu.
2. Select S-SCAN SETTING and press the [MENU] key to open the H-SCAN SETTING menu.
3. Select OTHERS and press the [MENU] key to show the OTHERS menu.



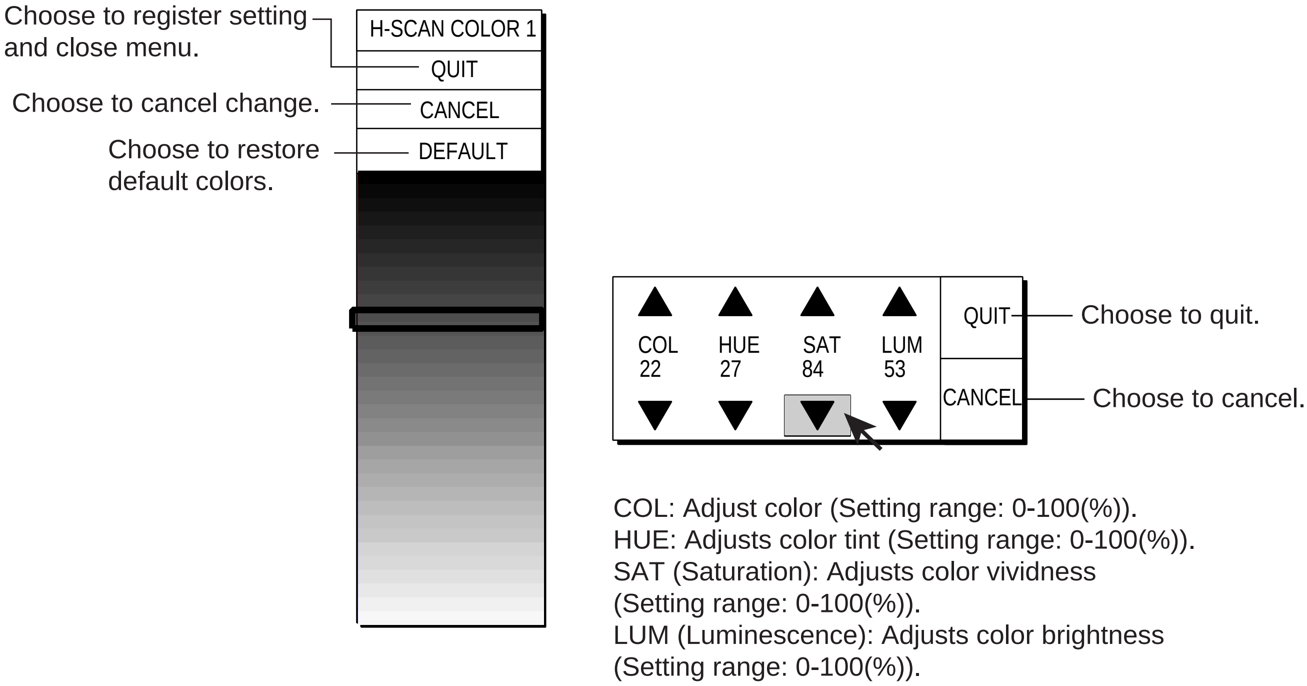
OTHERS sub menu

4.21.2 OTHERS menu description

COLOR: Select color arrangement to use. The default setting is COLOR 1.

COLOR SETTING…: Customizes colors.

1. Select COLOR SETTING from the OTHERS menu and press the [MENU] key. The following display appears.
2. Use the trackball to select color to change and press the [MENU] key.



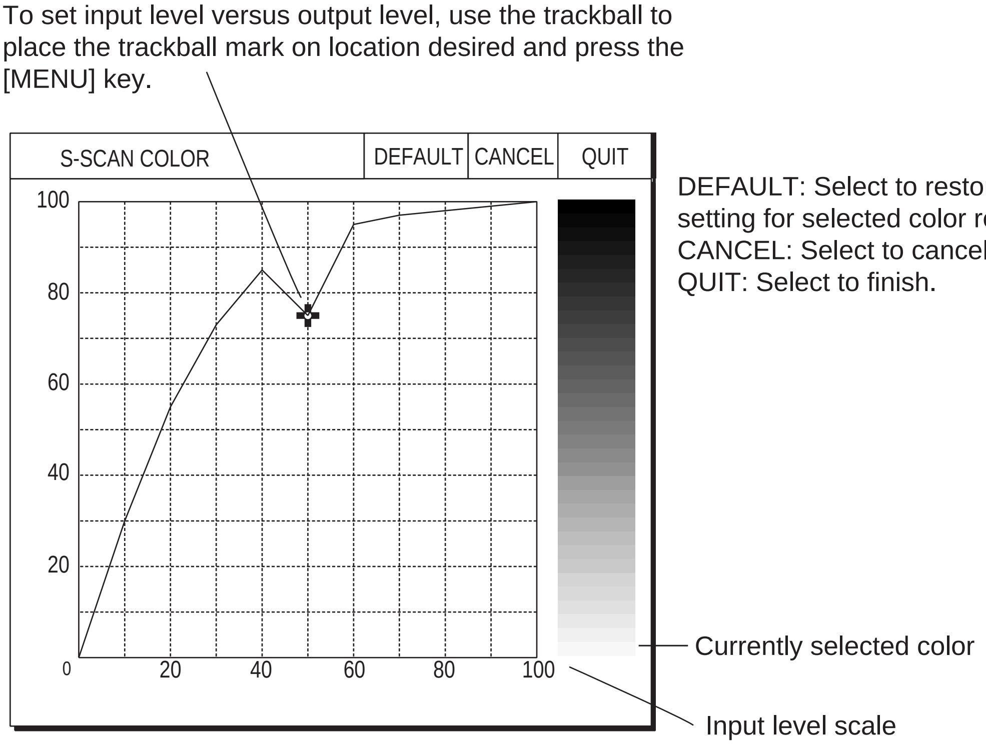
COLOR SETTING menu

3. Select ▲ or ▼ of item COL, HUE, SAT or LUM.
4. Press the [MENU] key to change the setting.
5. Repeat steps 3 and 4 to change level of other items.
6. Select QUIT and press the [MENU] key.
7. Repeat steps 2-6 to change other colors.
8. Select QUIT at the top of the menu and press the [MENU] key
9. Select QUIT at the top of the menu screen and press the [MENU] key to finish.

Note: If you get lost in operation and want to return to default colors, select DEFAULT and press the [MENU] key.

COLOR RESPONSE: Color response defines reflected echo strength versus color level conversion. You can select one of four color response tables, and the default setting is COLOR RESPONSE 3.

COLOR RESPONSE…: Adjusts reflected echo strength versus echo color level for currently selected color response number.
To adjust the curve, place the trackball at the point desired and press the [MENU] key. On the horizontal axis input level relative value is shown in the range from 0 to 100%. The setting range for input level is 0-100% in increments of 10% and output level is 0-100% in any value.



Color response curve

GAIN OFFSET: Adjusts gain level. If the front panel [GAIN] control does not provide satisfactory gain adjustment, enter an offset here. The setting range is 0-12.

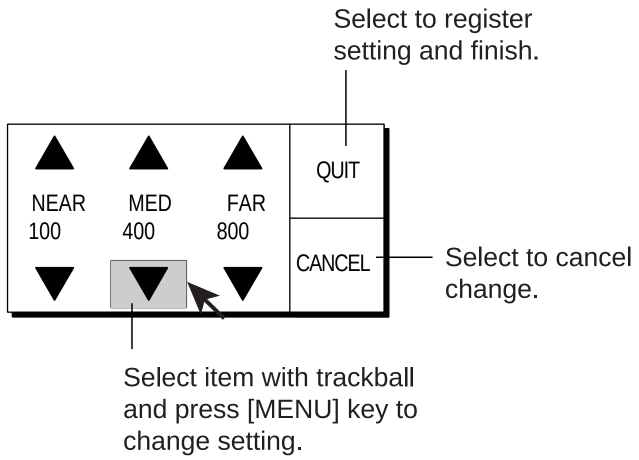
SIGNAL LEVEL: Dirty water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased in order of strength. The setting range is 0-15.

FAR TVG CURVE: Selects the TVG curve to use. The setting range is TVG1-TVG4. The higher the setting the sharper the gain curve.

ABSORPTION COEFF: Attenuation of the acoustic pulse underwater varies with sea area and water temperature. This menu item is provided to offset absorption, however the default setting is suitable in most cases. If sensitivity decreases with distance, increase the absorption coefficient setting. And if it increases with distance decrease this setting.

TVG DISTANCE: Sets the TVG effective distance for near, medium and far ranges.

<u>Setting range</u>
NEAR: 50-150 m, 10 m increments
MED: 300-500 m, 20 m increments
FAR: 600-1000 m, 40 m increments
To adjust a TVG curve, select ▲ or ▼ of item desired and press the [MENU] key to change the setting.



TVG setting window

2ND AGC DISTANCE: Sets starting distance that 2nd AGC functions. The setting range is 0 to 2000 m, in increments of 20 m. Setting is invalid if display range is lower than this setting.

NEAR AGC DISTANCE: Sets Near AGC effective distance. Set the range between 20 m and 300 m, in increments of 20 m.

SMOOTH ECHO RNG: Selects echo smoothing level in the range direction. The setting range is 0-3. The higher the setting the greater the smoothing.

SMOOTH ECHO CIR: Selects echo smoothing level in circular direction. The setting range is 0-3. The higher the setting the greater the smoothing.

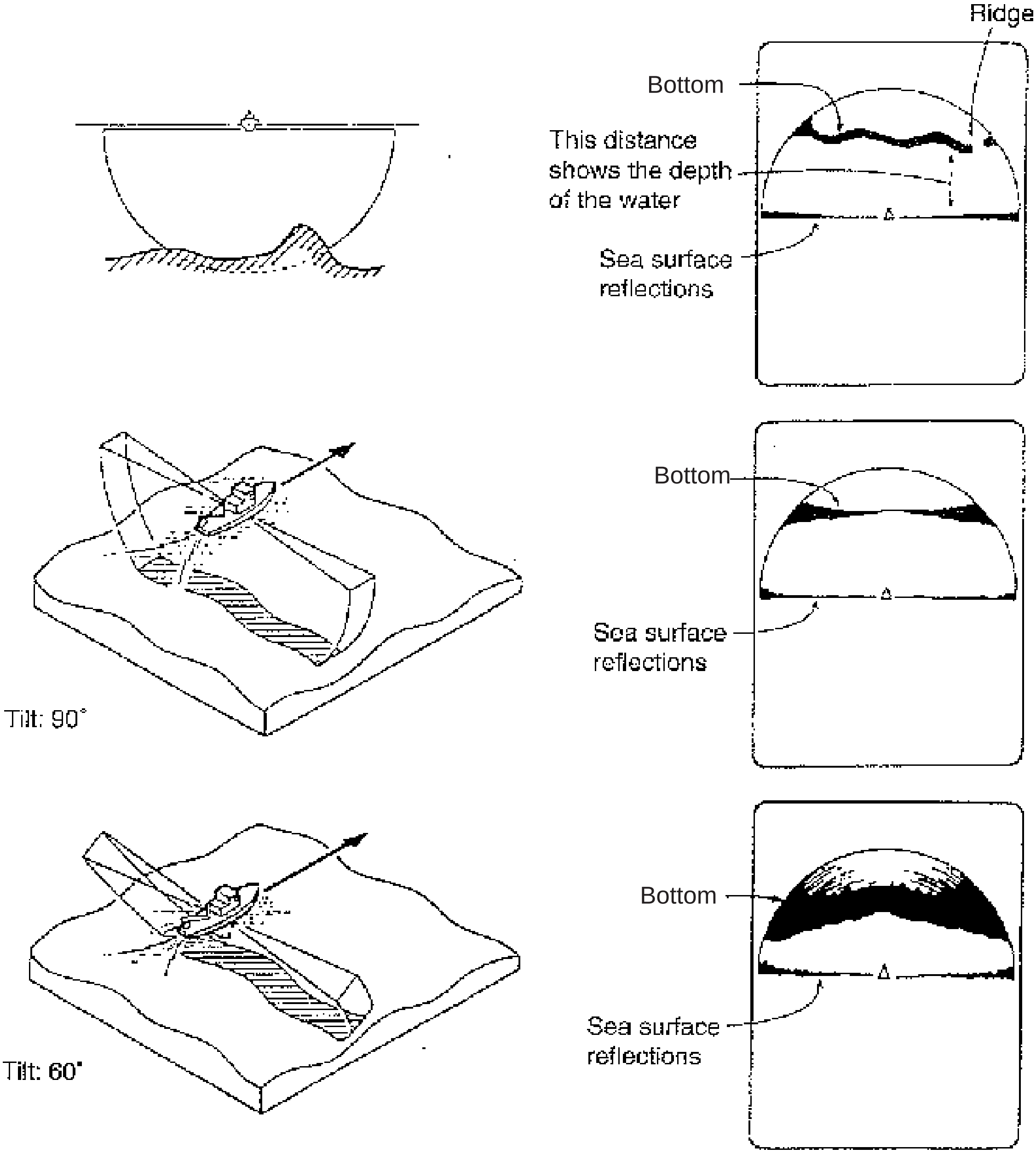
GAIN CONTROL: If sensitivity is low even with maximum gain, change the setting to WIDE. This doubles the control range.

BEAMWIDTH: Adjusts horizontal beamwidth. For further details see “4.11 Adjusting Beamwidth”.

4.22 Interpreting the Slant Display

4.22.1 Bottom echoes

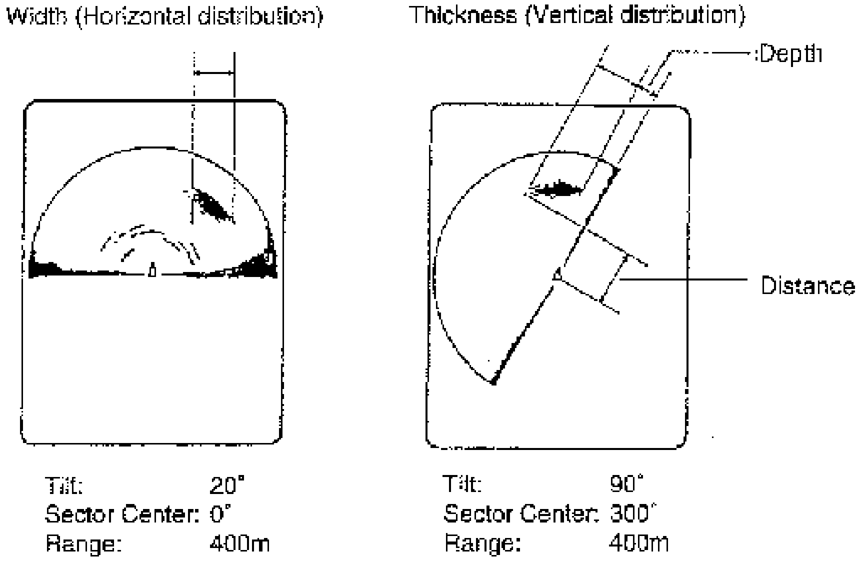
When the tilt angle is set at 90 degrees with the sector center faced dead ahead, the pictures illustrated below will appear on the screen. The bottom echo is represented on the screen as a thick line which realistically shows the bottom contour. When the tilt angle is decreased, the bottom trace becomes wider and weaker. By observing bottom condition on the screen, you may prevent the net from being damaged by a reef or a shipwreck.



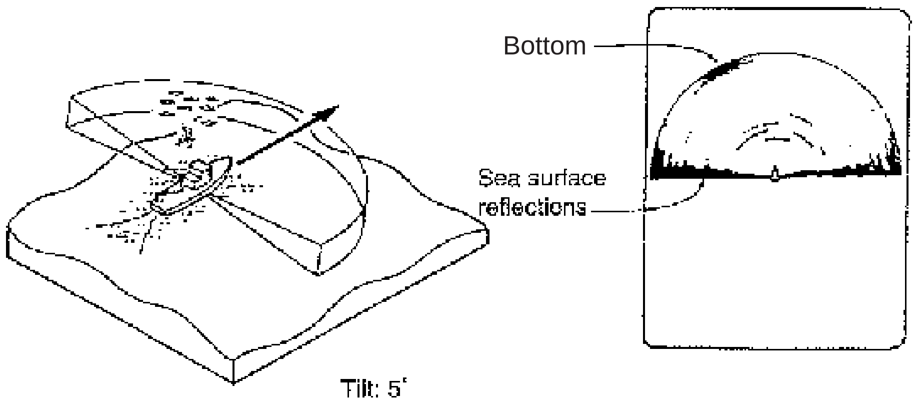
Bottom echoes

4.22.2 Fish schools

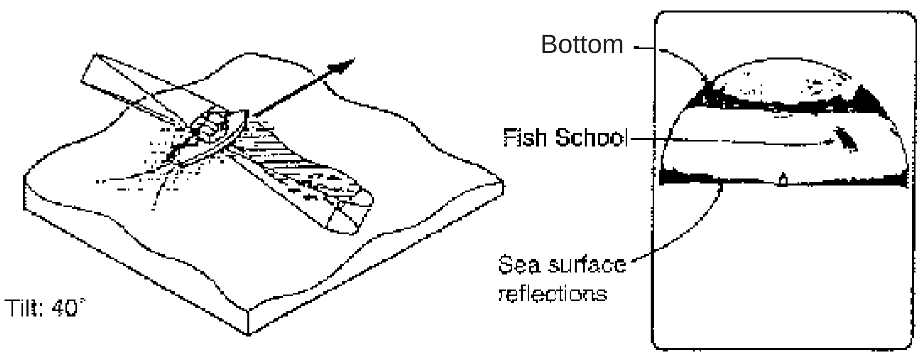
A fish school appears as a mass of echoes on the screen. The color of the mass shows the density of the fishes and the size of the mass how they are distributed. In the following figures, the same fish school is observed with two different tilt angles. From the left figure, the operator can know the horizontal distribution of the fish school, and from the right figure the vertical distribution.



Surface fish school

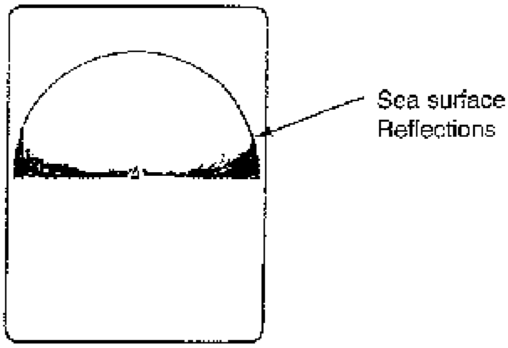


Bottom fish school



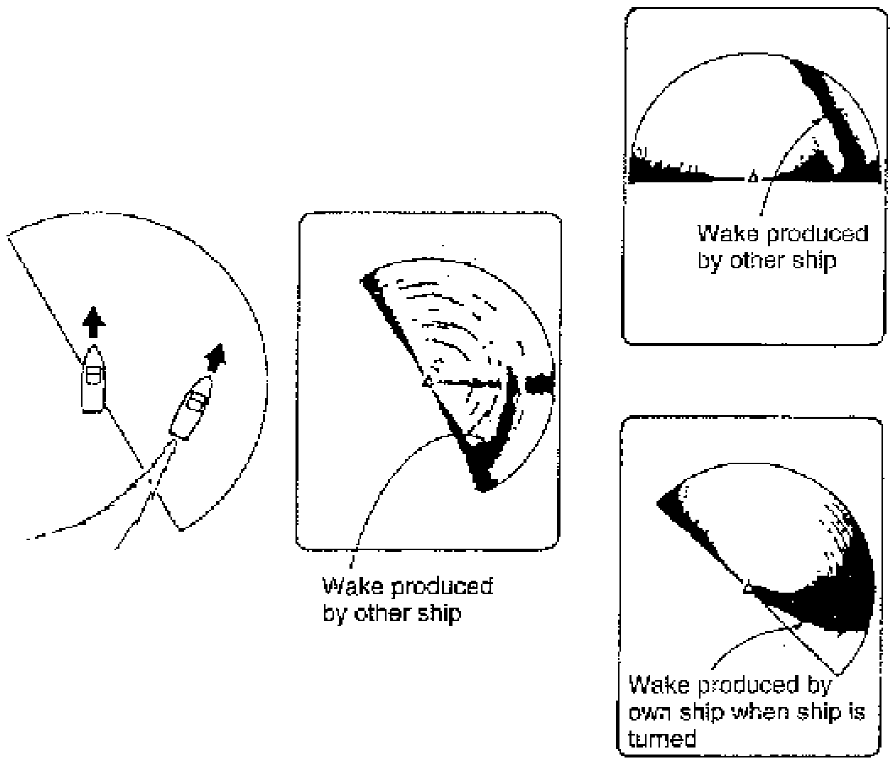
4.22.3 Sea surface reflections

As ultrasonic pulses at both edges of the 180° sector beam are always emitted horizontally along the sea surface regardless of the tilt angle setting, sea surface reflections appear as a thick line extending across the own ship mark. When the sonar is used with a narrow tilt angle, the sea surface reflections cover an extended area as illustrated below.



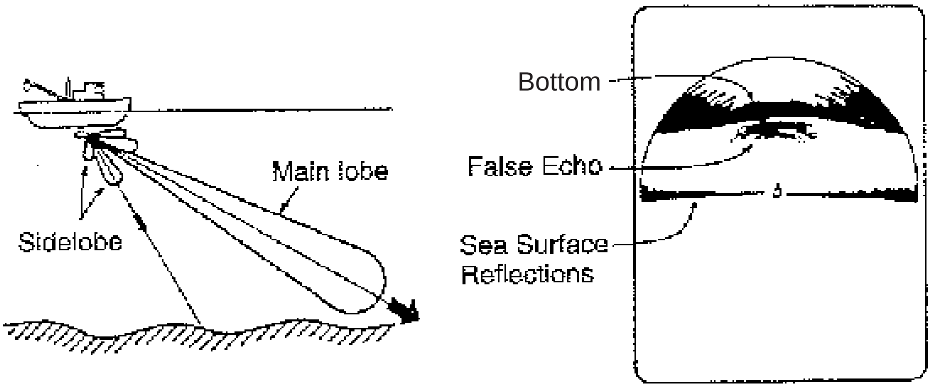
4.22.4 Wake

A wake produced by own ship or another ship can be a strong reflecting object when a narrow tilt angle is used. As the wake appears as a thick continuous line, it can be easily distinguished from a fish school. A wake contains many air bubbles which attenuate ultrasonic energy, making it difficult to sound beyond the wake.



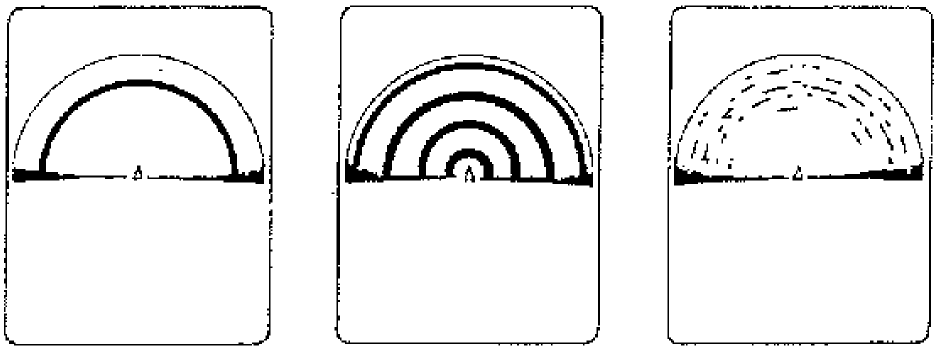
4.22.5 False echo by sidelobe

An ultrasonic wave is emitted only in the direction set by the TILT lever, however there are some emissions outside the main beam. These are called sidelobes. The energy of the sidelobe is fairly weak but when the water is comparatively shallow and the bottom is rocky and hard, strong signals are detected by the sidelobe. These are represented on the display as a false echo as shown below.



4.22.6 Noise and interference

Interference from a sonar on another ship appears on the screen as shown in (A). (B) shows Interference from electrical equipment on board own ship. Noise from marine life appears on the display as shown in (C).



(A) Interference from other sonar

(B) Electrical interference

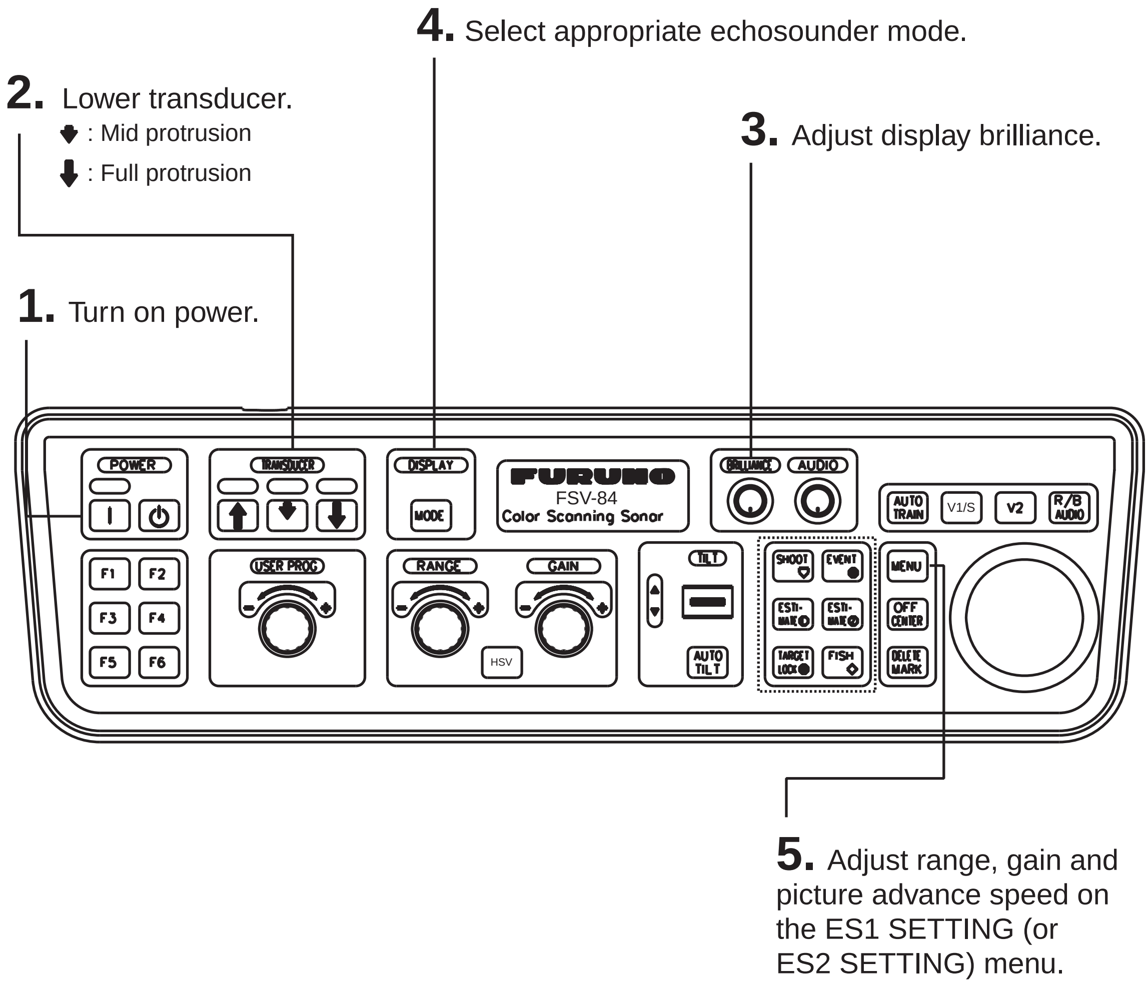
(C) Marine life noise

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5. ECHO SOUNDER MODE

The echo sounder picture is available with connection of an echo sounder.

5.1 Basic Operating Procedure

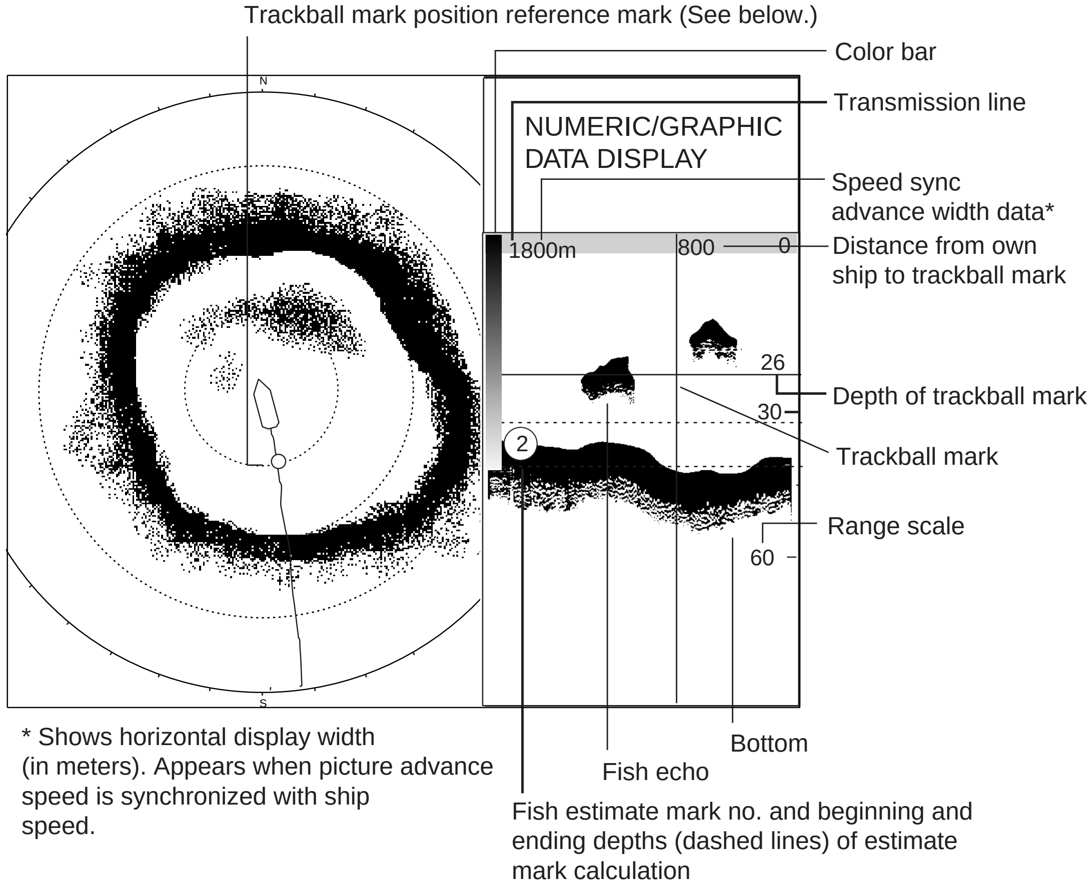


Control unit

5.2 Typical Echo Sounder Displays

5.2.1 Echo sounder 1 display

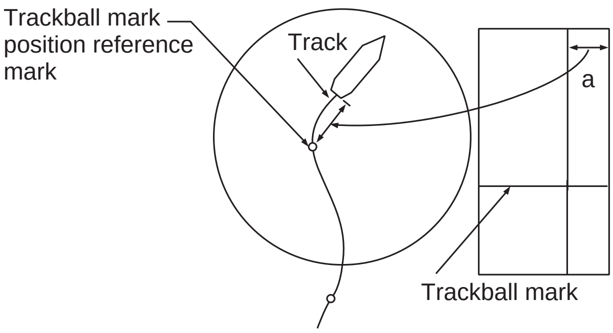
This display shows the picture from an echo sounder on the right-hand side of the display.



Indications and markers on the echo sounder 1 display

<u>Trackball mark position reference mark</u>

The trackball mark position reference mark, a solid circle, is inscribed on the ship's track when the trackball mark is placed in the echo sounder display. Its purpose is to show corresponding trackball mark position on the horizontal display. It changes position with trackball mark position and tilt range, and disappears when its position is no longer within the range of the echo sounder display. This mark does not appear when the distance to the trackball mark is longer than the track length. Own ship's speed data is required for this function.

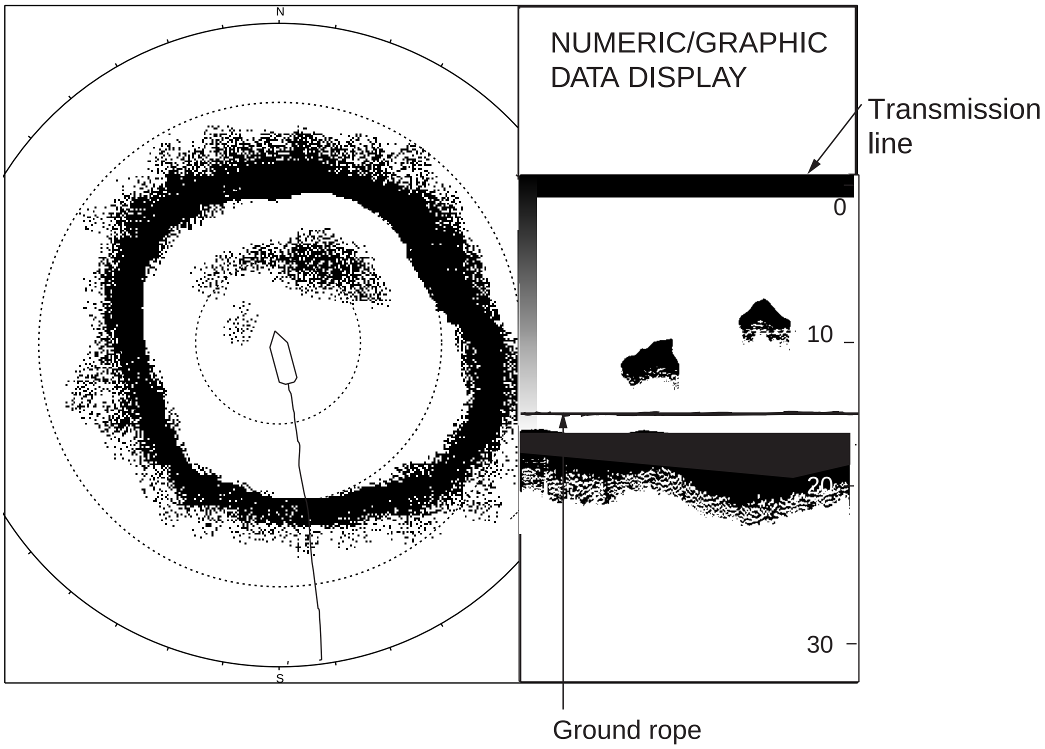


Trackball mark position reference mark

5.2.2 Echo sounder 2 (net recorder or echo sounder) display

With net recorder connection, the echo sounder 2 display can show the picture from the net recorder. (The picture from an echo sounder may also be shown.) You may show the net recorder's downward-looking picture.

Downward-looking net recorder display

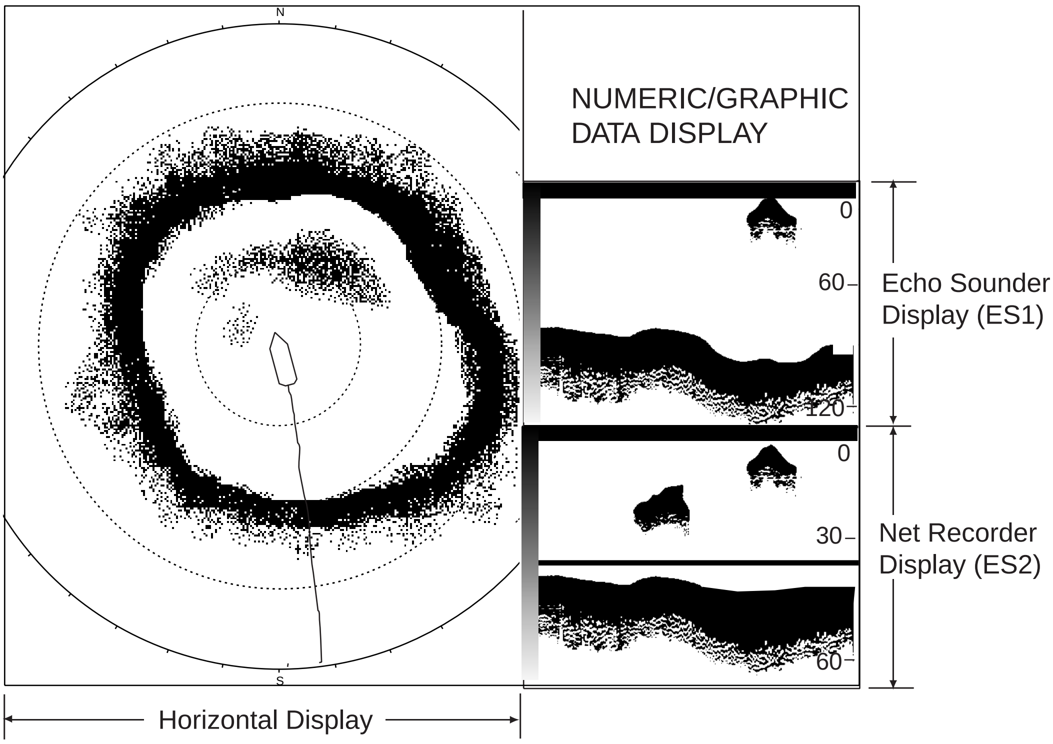


Indications and markers on the echo sounder 2 display
(shown: downward looking display)

5.2.3 Echo sounder combination mode (ES1 + ES2)

This display shows the picture from the echo sounder and the net recorder. Also two echo sounder pictures can be displayed, or upward and downward looking display of the net recorder can be displayed.

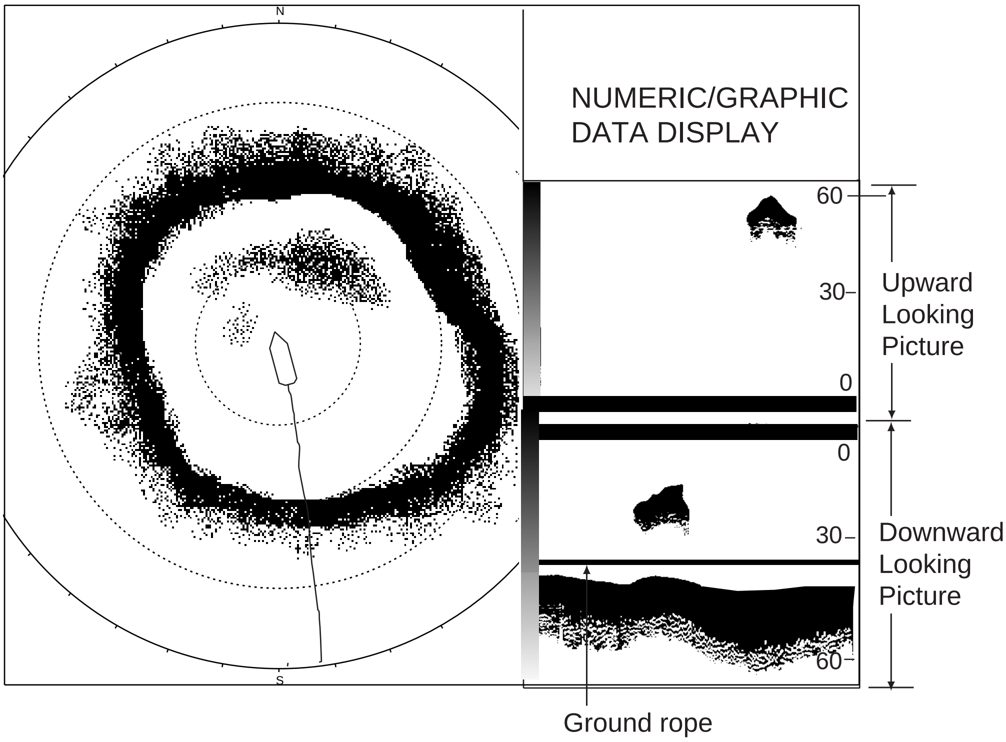
Echo sounder + net recorder display



Echo sounder combination display

Upward + downward looking net recorder display (ES2 mode)

The marks and indications which appear on the downward looking display are also common to the upward + downward looking display.



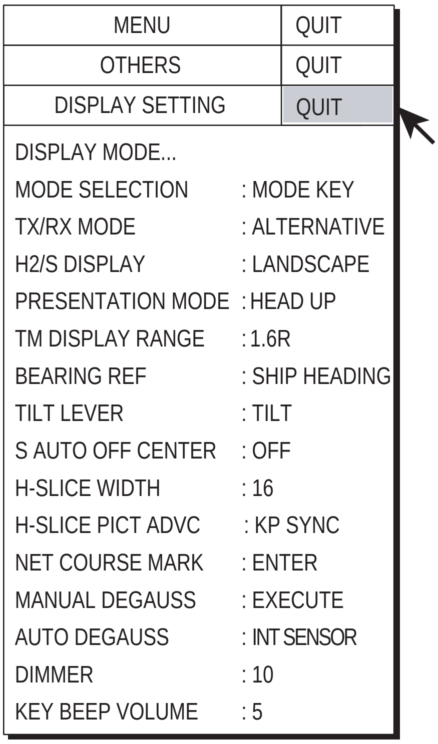
Echo Sounder 2 display (Upward + downward looking display)

5.3 Selecting an Echo Sounder Mode

An echo sounder mode may be selected with the [MODE] key, however no echo sounder mode is available in the default setting. To enable selection of an echo sounder mode with the [MODE] key, follow the procedure below.

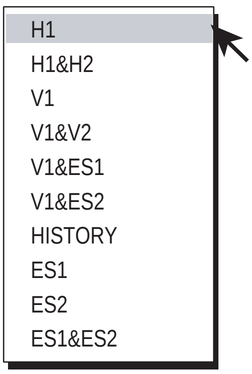
Enabling an echo sounder mode

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.



DISPLAY SETTING menu

4. Select DISPLAY MODE and press the [MENU] key to show the display mode dialog box.



Display mode dialog box

5. Select desired ES modes (you may select as many modes as you wish) referring to the illustration below and press the [MENU] key. The check marks in the dialog box denote active modes.

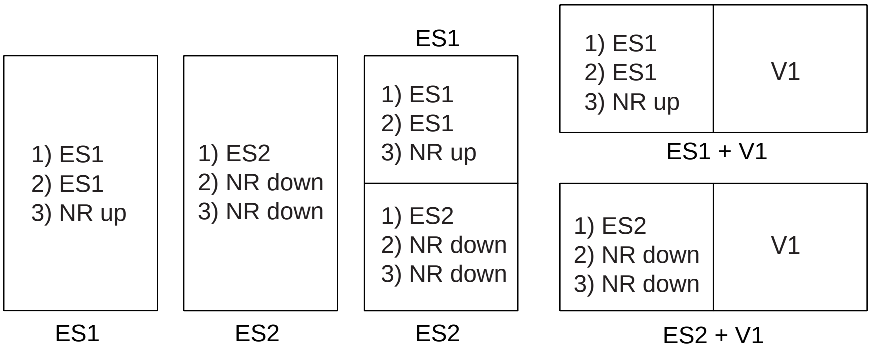
   ES1: Echo sounder picture
   ES2: Net recorder picture (or echo sounder picture)

   Depending on the menu setting, the screen combination can be shown as follows.

System menu setting and available displays

ES2 on the SYSTEM menu*	NET RECORDER DISP** on ES2 SETTING menu	Sample
ES	None	1)
NR	NR down	2)
	NR up, NR down	3)

* = For details about the SYSTEM menu, contact your dealer or refer to the installation manual.
** = When NET RECORDING DISP is set for UP/DOWN, the ES1 picture changes from the echo sounder picture to the downward looking net recorder picture.



ES: Echo sounder picture
NR up: Net Recorder upward picture
NR down: Net Recorder downward picture
V1: Vertical mode picture

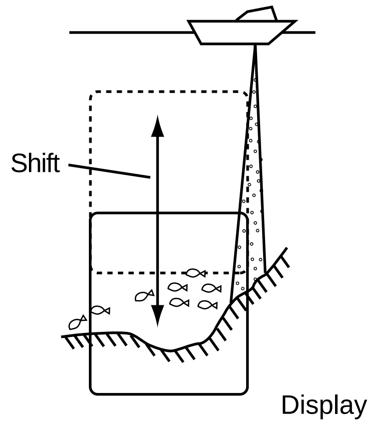
Echo sounder mode configurations and menu setting

6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

5.4 Selecting Display Range

The basic range and range shifting functions together give you the means to select the depth you can see on the screen. The basic range can be thought of as providing a “window” into the water column and range shifting as moving the “window” to the desired depth.

Note: Set the range and shift so they are the same as those set on the echo sounder. This setting does not affect the original echo sounder setting.



Range and display shift concept

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ES1 SETTING (or ES2 SETTING) and press the [MENU] key.

MENU	QUIT
OTHERS	QUIT
ES1 SETTING	QUIT
GAIN	: 5
RANGE	: 160 m
SHIFT	: 0 m
CLUTTER	: 0
SIGNAL LEVEL	: 0
INT REJECT	: OFF
PICTURE ADVANCE	: 1/1
PICT ADVC AT SHOOT	: SPEED SYNC
COLOR SETTING...	
COLOR RESPONSE...	
SCALE POSITION	: RIGHT

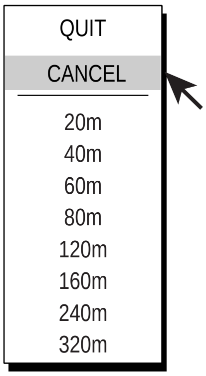
ES1 SETTING menu

MENU	QUIT
OTHERS	QUIT
ES2 SETTING	QUIT
GAIN	: 5
RANGE BELOW NET	: 160 m
RANGE UPPER NET	: 160 m
CLUTTER	: 0
SIGNAL LEVEL	: 0
INT REJECT	: OFF
PICTURE ADVANCE	: 1/1
COLOR SETTING...	
COLOR RESPONSE...	
NET RECORDER DISP	: UP/DOWN
NET RECORDER RANGE	: 80 m

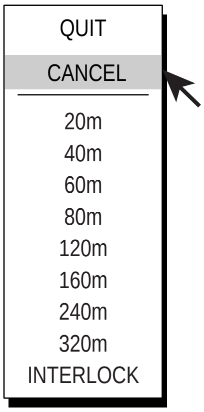
ES2 SETTING menu
(net recorder connected)

ES1 SETTING, ES2 SETTING menus

4. Select RANGE (or RANGE UPPER NET, RANGE BELOW NET in case of net recorder on the ES2) and press the [MENU] key.



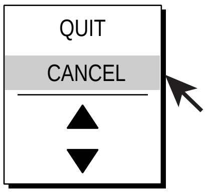
RANGE menu
(ES1 SETTING menu)



RANGE menu
(ES2 SETTING menu)

Range dialog box

5. Use the trackball to select range desired and press the [MENU] key. (INTERLOCK in the range dialog box for the ES2 SETTING menu uses the same range as set for ES1. It is effective when the ES2 display is in use.)
6. Select QUIT and press the [MENU] key.
7. Select SHIFT in case of echo sounder ES1 and press the [MENU] key.



Dialog box for setting numeric data

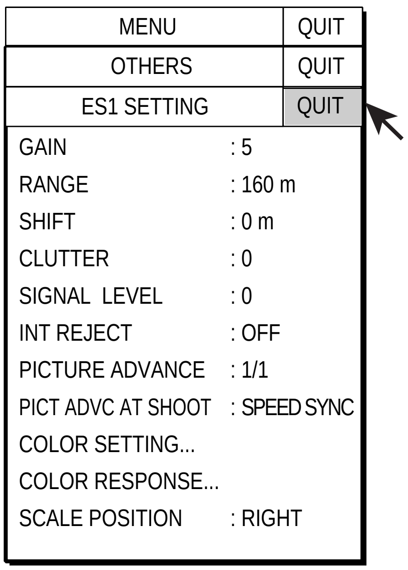
8. Use the trackball to select ▲ or ▼ and press the [MENU] key to select shift desired. The shift range is 0-1000 m.
9. Select QUIT and press the [MENU] key.
10. Select QUIT at the top of the menu screen and press the [MENU] key to close the menu.

5.5 Adjusting the Gain

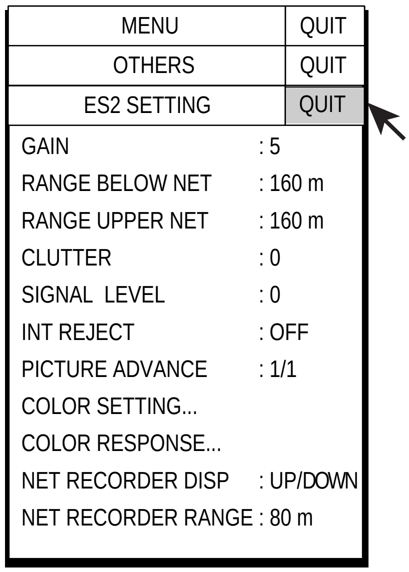
You may adjust the display level of the echo sounder picture as below; the gain of the echo sounder itself cannot be adjusted from the sonar.

Note: Set the range and shift so they are the same as those set on the echo sounder. This setting does not affect the original echo sounder setting.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ES1 SETTING (or ES2 SETTING) and press the [MENU] key.



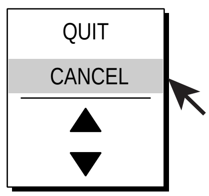
ES1 SETTING menu



ES2 SETTING menu
(net recorder connected)

ES1 SETTING and ES2 SETTING menus

4. Select GAIN and press the [MENU] key.



Dialog box for setting numeric data

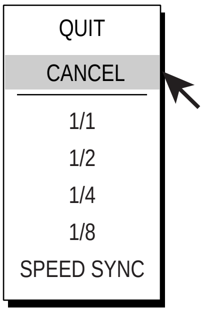
5. Use the trackball to select ▲ or ▼ and press the [MENU] key to select gain desired. The setting range is 0-10. The higher the setting the greater the gain.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close the menu.

5.6 Picture Advance Speed

The picture advance speed determines how quickly the vertical scan lines run across the screen. When selecting a picture advance speed, keep in mind that a fast advance speed will expand a fish school horizontally and a slow advance speed will contract it.

Note: Set the picture advance speed to the same setting as on the echo sounder connected. This setting does not affect the original echo sounder setting.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ES1 SETTING (or ES2 SETTING) and press the [MENU] key.
4. Select PICTURE ADVANCE and press the [MENU] key.



Picture advance speed dialog box

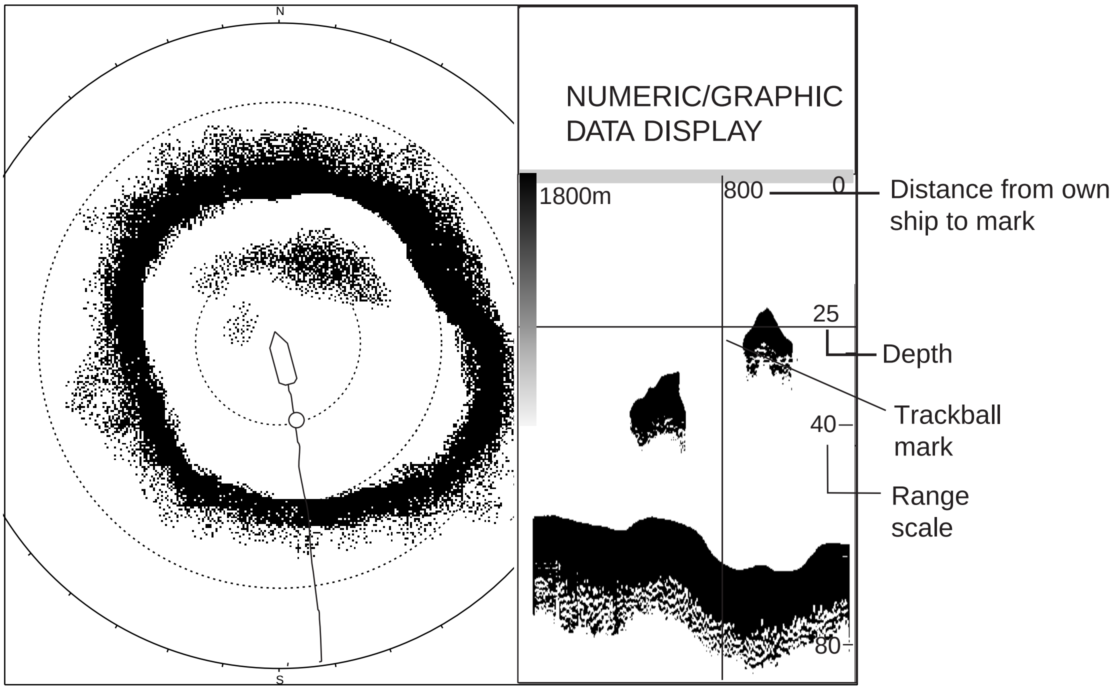
5. Use the trackball to select advance speed desired and press the [MENU] key. The fractions in the dialog box are one line produced per number of transmissions. For example, 1/2, displays one scan line per two transmissions. SPEED SYNC advances the picture according to ship's speed. This mode is advantageous for judging fish school size and abundance since fish schools will be shown at their actual sizes regardless of ship's speed.

   Note: When using "SPEED SYNC," and the echo sounder signal becomes lost, the picture shown at the time the signal was lost is copied and continuously replayed on the screen until the echo sounder signal is restored.

6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close the menu.

5.7 Measuring Depth, Distance

You can measure depth and distance (picture advance set for “speed sync”) from own ship to a location with the trackball mark. Use the trackball to place the trackball mark on the location. The trackball mark shows depth on its horizontal axis and distance on its vertical axis.



How to measure depth and distance on the echo sounder display

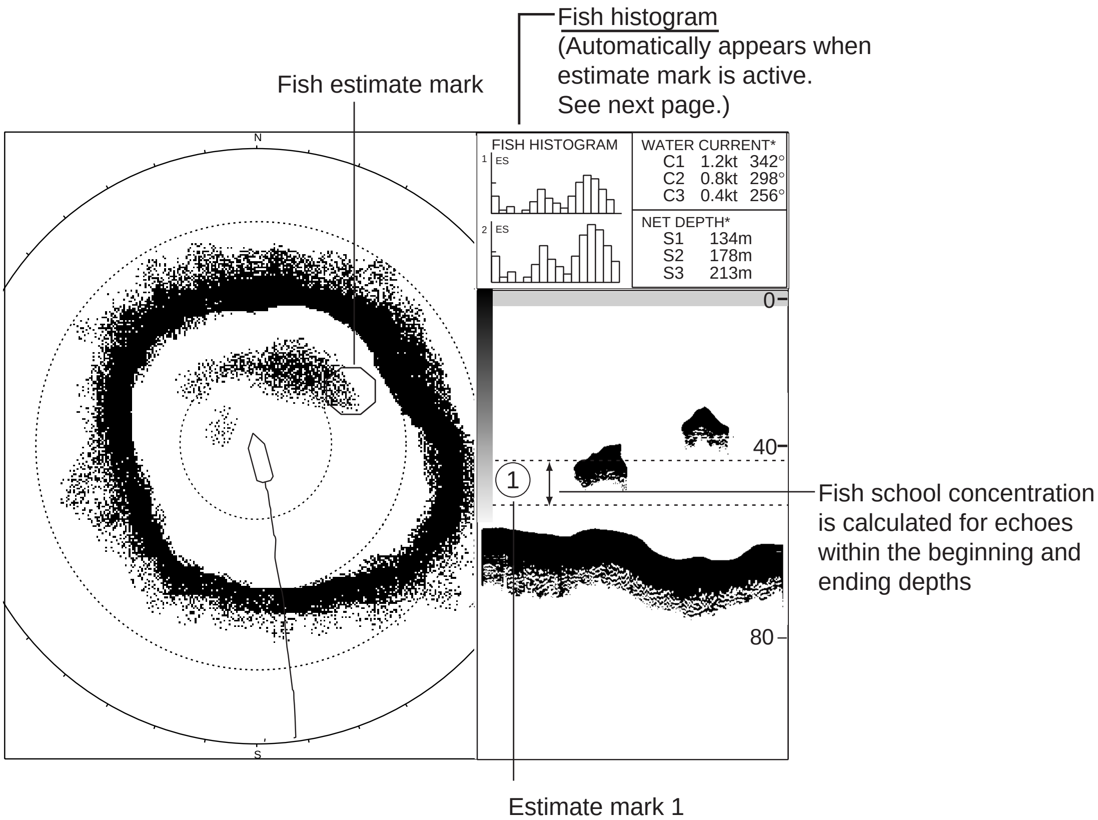
5.8 Comparing Fish School Concentration

You can get an estimate of the volume of two fish schools by using the two ESTIMATE keys as below. You may use these keys in the ES1 and ES2 modes.

1. Use the trackball to set the trackball mark at the center of fish school and press the [ESTIMATE 1] or [ESTIMATE 2] key. The beginning and ending depths are marked with dashed lines. A circle with the number 1 or number 2 inside is displayed, shown by a dashed line.

   Note: The processing range, that is, the area between the dashed lines, can be selected with ESTIMATE ON ES in the MARK SIZE menu. The choices available are 1/8 (default setting), 1/4 and 1/2, of the echo sounder display range.

2. Observe the fish histogram. See next page.
3. To turn off the estimate mark, press the [ESTIMATE 1] or [ESTIMATE 2] key whichever was pressed at step 1.



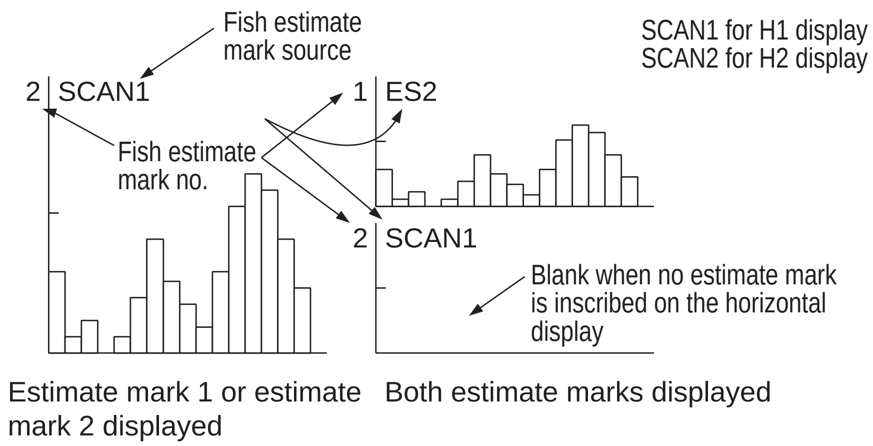
Estimating fish concentration with estimate marks

Fish histogram

The fish histogram shows, in graph form, signal strength distribution for the fish school(s) marked with an estimate mark on the horizontal and echo sounder displays. The histogram display for each of those displays will be different since the calculation method is different. This data appears only when an estimate mark is active. When two estimate marks are active histograms are displayed one on top of the other as below.

The horizontal axis shows signal strength in 16 colors, and the vertical axis shows fish school concentration inside the fish estimate mark. For the fish estimate mark inscribed on the horizontal display the graph shows the average movement in five scans, to increase accuracy.

Note: The histogram display is redrawn five transmissions after a fish estimate mark is erased and another mark of the same number is entered soon after.

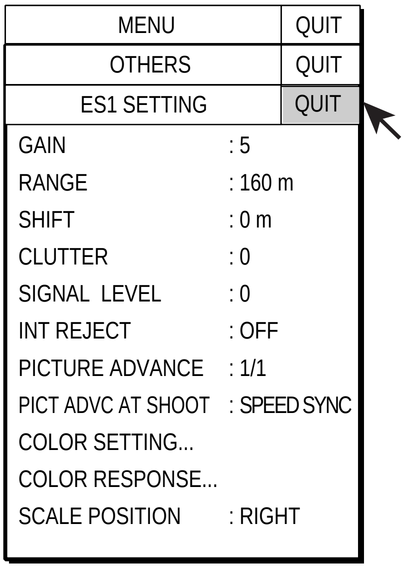


Fish histogram

5.9 ES1 SETTING Menu Overview

Display the ES1 SETTING menu as follows.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ES1 SETTING and press the [MENU] key.



ES1 SETTING menu

ES1 setting menu description

The GAIN, RANGE, SHIFT and PICTURE ADVANCE are described at the previous pages. For the COLOR SETTING and the COLOR RESPONSE, see page 2-48 and 2-49, respectively.

CLUTTER: Suppress low level noise, which shows itself on the display as light-blue dots. The setting range is 0-10 and 0 is clutter rejection off. The higher the setting, the greater the degree of suppression.

SIGNAL LEVEL: Dirty water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased in order of strength. The setting range is 0-15.

INT REJECT: Turn on to suppress interference from other equipment on board.

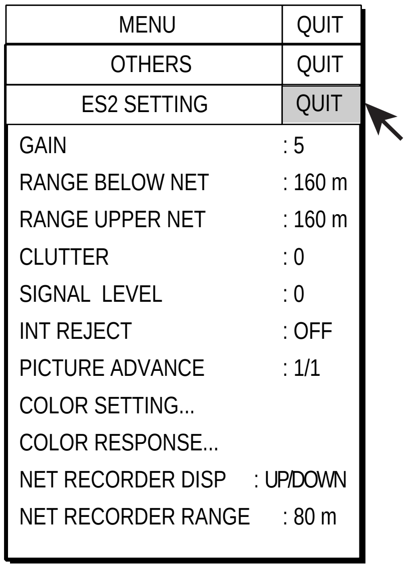
PICT ADVC AT SHOOT: Sets picture advance speed to set when shooting of the net. You may select advance speed independently or synchronize it with ship’s speed.

SCALE POSITION: The range scale can be displayed on the right or left side of the echo sounder display.

5.10 ES2 SETTING Menu Overview

Display the ES2 SETTING menu as follows.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ES2 SETTING and press the [MENU] key.



ES2 SETTING menu (net recorder connected)

ES2 SETTING menu description

The GAIN and PICTURE ADVANCE are described at the previous pages. For the COLOR SETTING and the COLOR RESPONSE, see page 2-48 and 2-49, respectively.

RANGE or RANGE BELOW NET: Selects the echo sounder display range, among 20, 40, 60, 80, 120, 160, 240, 320 m and interlock with ES1. With connection of a net recorder it is the range below the oscillation line.

SHIFT or RANGE UPPER NET: Shifts the display range for ES. The shift range is 0-1000 m. Note that RANGE (above) must be set to INTERLOCK to set SHIFT to INTERLOCK. With connection of a net recorder it is the range above the oscillation line. Select the range among 20, 40, 60, 80, 120, 240 and 320 m.

CLUTTER: See CLUTTER on previous page.

SIGNAL LEVEL: See SIGNAL LEVEL on previous page.

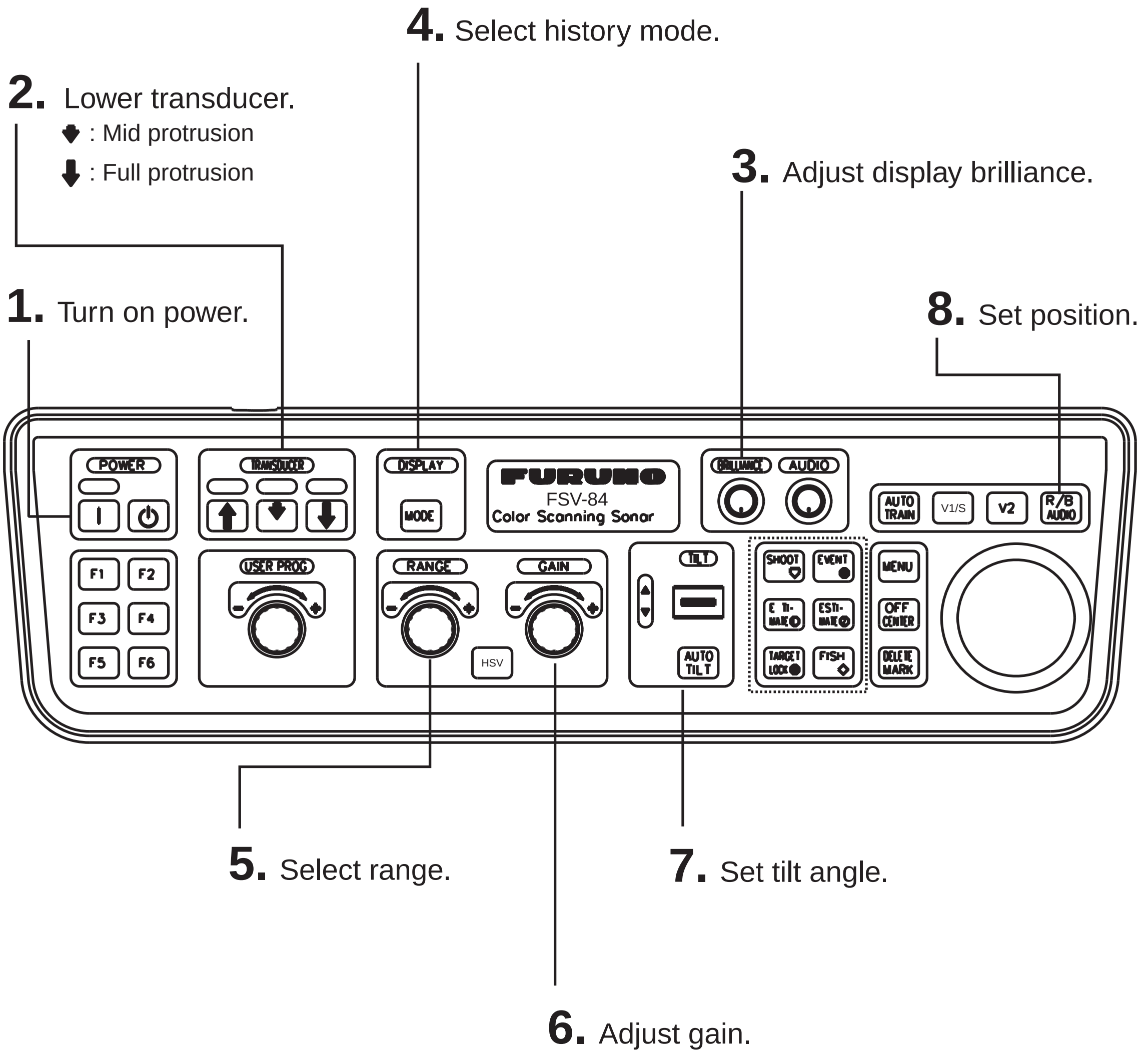
INT REJECT: See INT REJECT on previous page.

NET RECORDER DISP: Chooses the net recorder picture to display; downward sounding picture or both upward and downward sounding pictures. The default setting is the downward sounding picture.

NET RECORDER RANGE: Sets the net recorder display range, referring to the operator’s manual of net recorder.

6. HISTORY MODE

6.1 Basic Operating Procedure

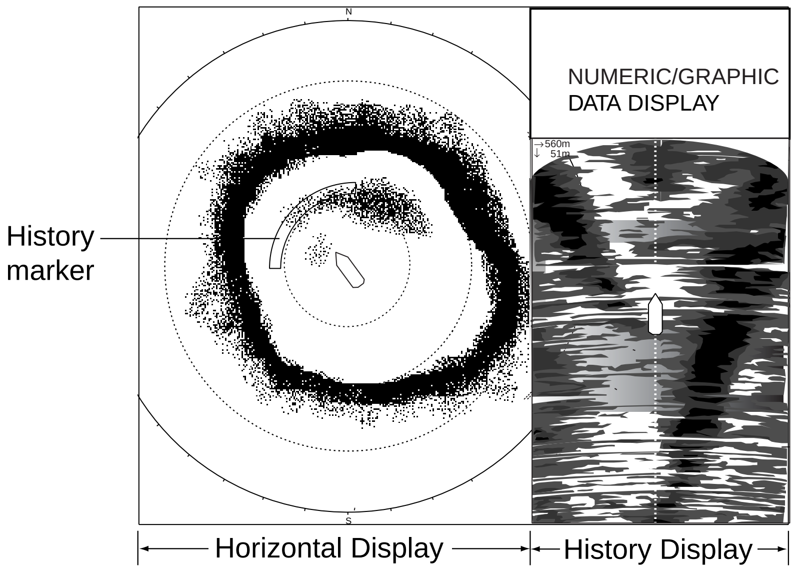


Control unit

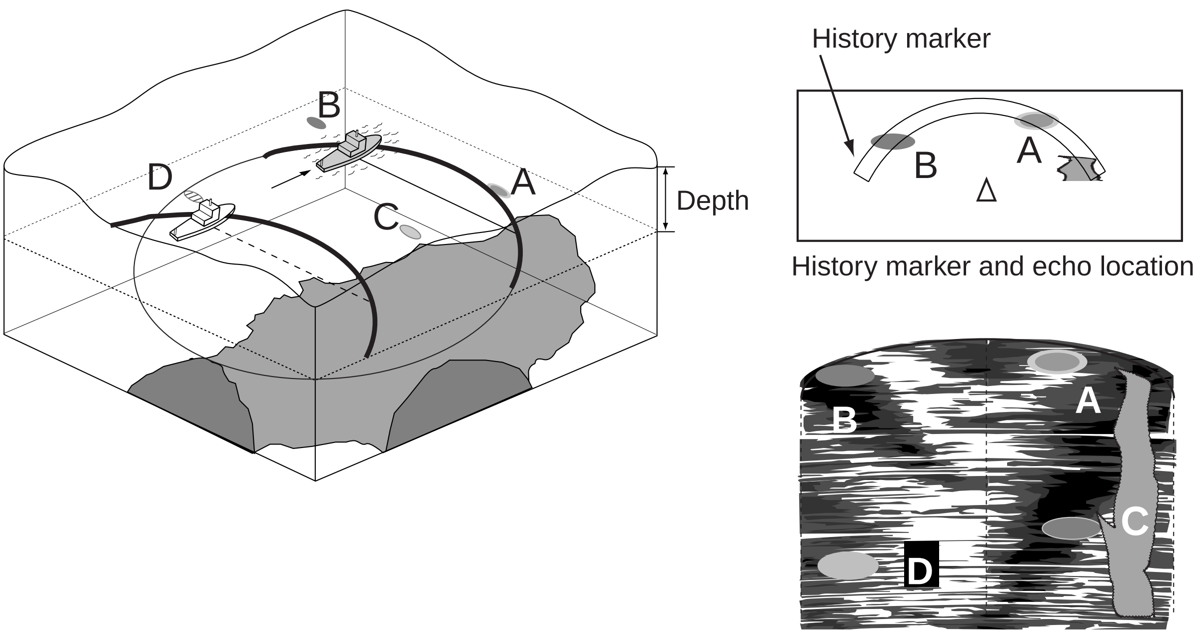
6.2 Sample History Display

The history display shows echo data for the echoes within the history marker, which is a 120° arc centered on the own ship position on the horizontal display. The history marker scrolls downward on the history display – the latest echoes at the top and the oldest at the bottom. Echoes are averaged for three transmissions for easy viewing. This mode is useful for watching echo condition over a period of time.

Use the trackball to select location for the history marker. When the tilt angle is changed, the slant range is automatically changed to keep the history marker at a constant depth; however, like an echo sounder, the picture inscribed before the tilt angle was changed is not refreshed.



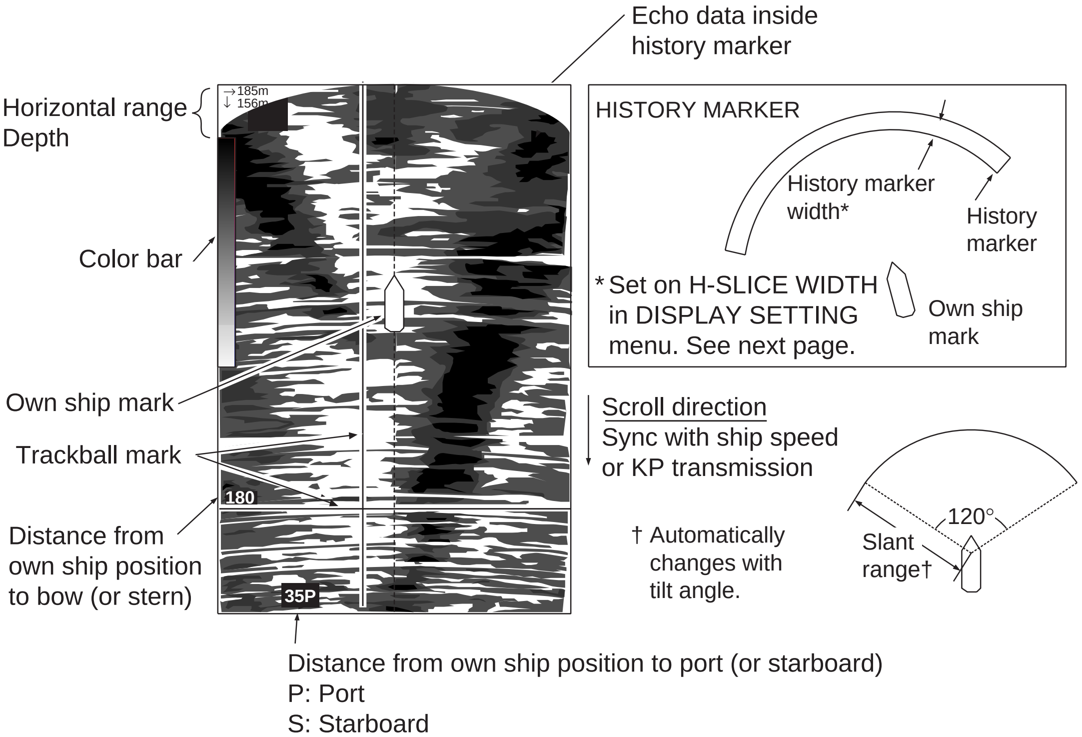
History display



History mode concept

6.3 How to Interpret, Set the History Display

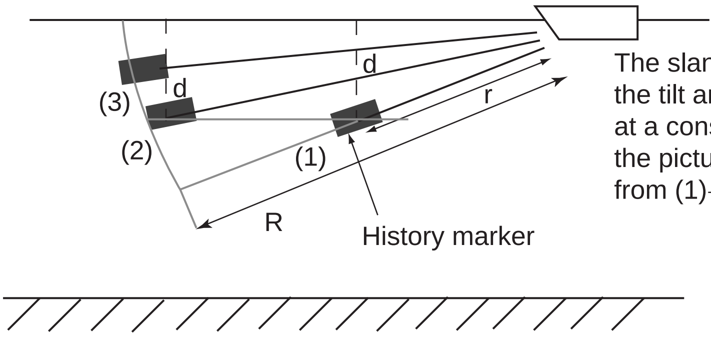
6.3.1 Interpreting the history display



How to interpret the history display

6.3.2 Setting the history marker

Use the trackball to locate the trackball marker on the horizontal display and then press the [R/B AUDIO] key. The history marker moves to the trackball marker and is centered on the ship's bow, extending 60° in both port and starboard directions. Own ship mark is fixed at own ship position. The slant range is automatically changed whenever the tilt angle is changed, to keep the history marker at a constant depth. When the tilt angle is shallow and the slant range to the history marker is greater than the range set with the RANGE control, the sampling point becomes the range in use.



The slant range is automatically changed whenever the tilt angle is changed, to keep the history marker at a constant depth. When a shallow tilt angle is used, the picture inside the history marker is from (1)→(2)→(3), according to tilt angle.

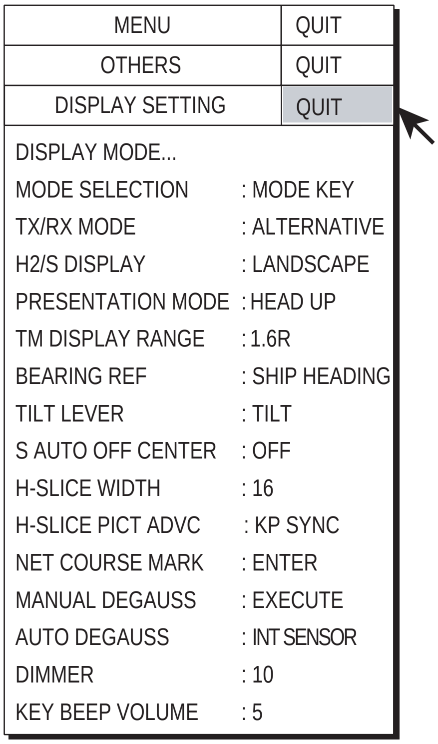
R: Range (Range set by RANGE control)
r: Slant range to history marker, set with trackball. Automatically changes with tilt angle.
d: Depth (constant) to history marker

Slant range and tilt angle

6.3.3 Setting the width of the history marker

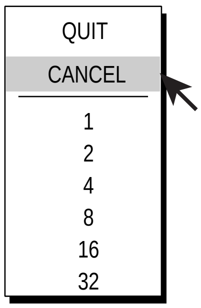
You may set the width of the history marker as follows:

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.



DISPLAY SETTING menu

4. Select H-SLICE WIDTH and press the [MENU] key.



Horizontal slice width dialog box

5. Use the trackball to select 1, 2, 4, 8, 16 or 32 as appropriate and press the [MENU] key.

   The numeric options are the number of display dots. For example, “16”, the default setting, extracts 16 dots from the horizontal display.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

6.3.4 Setting the picture advance mode

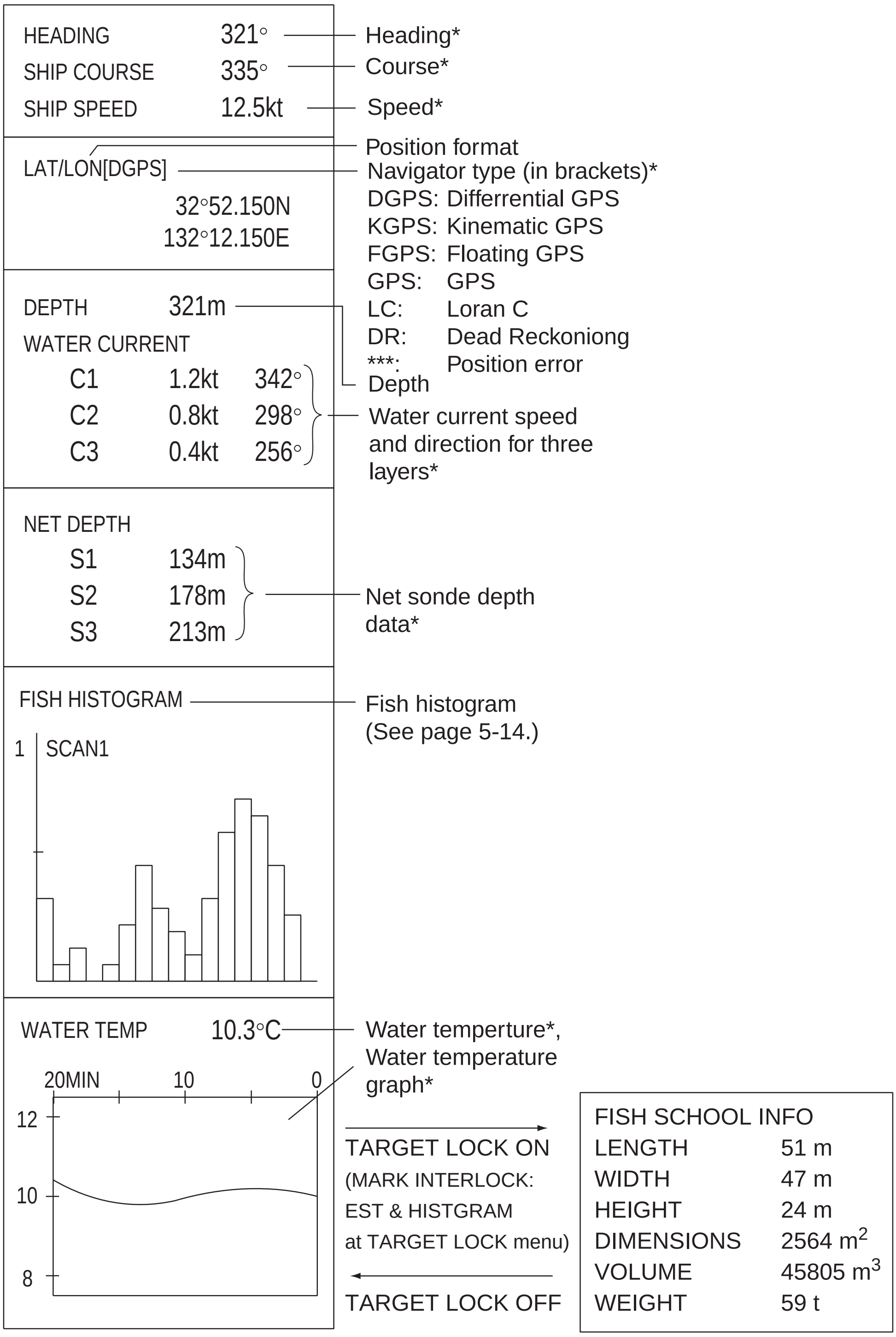
You may choose to advance the picture at each transmission (KP SYNC) or in proportion to ship speed (SPEED SYNC).

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.
4. Select H-SLICE PICT ADVC and press the [MENU] key.
5. Select SPEED SYNC or KP SYNC as appropriate and press the [MENU] key.
6. Select QUIT and press the [MENU] key.
7. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

7. NUMERIC/GRAPHIC DATA DISPLAY

7.1 Full Numeric/Graphic Data Display

This display provides comprehensive Numeric/graphic data and appears with the horizontal and vertical displays, at the right side of the display.

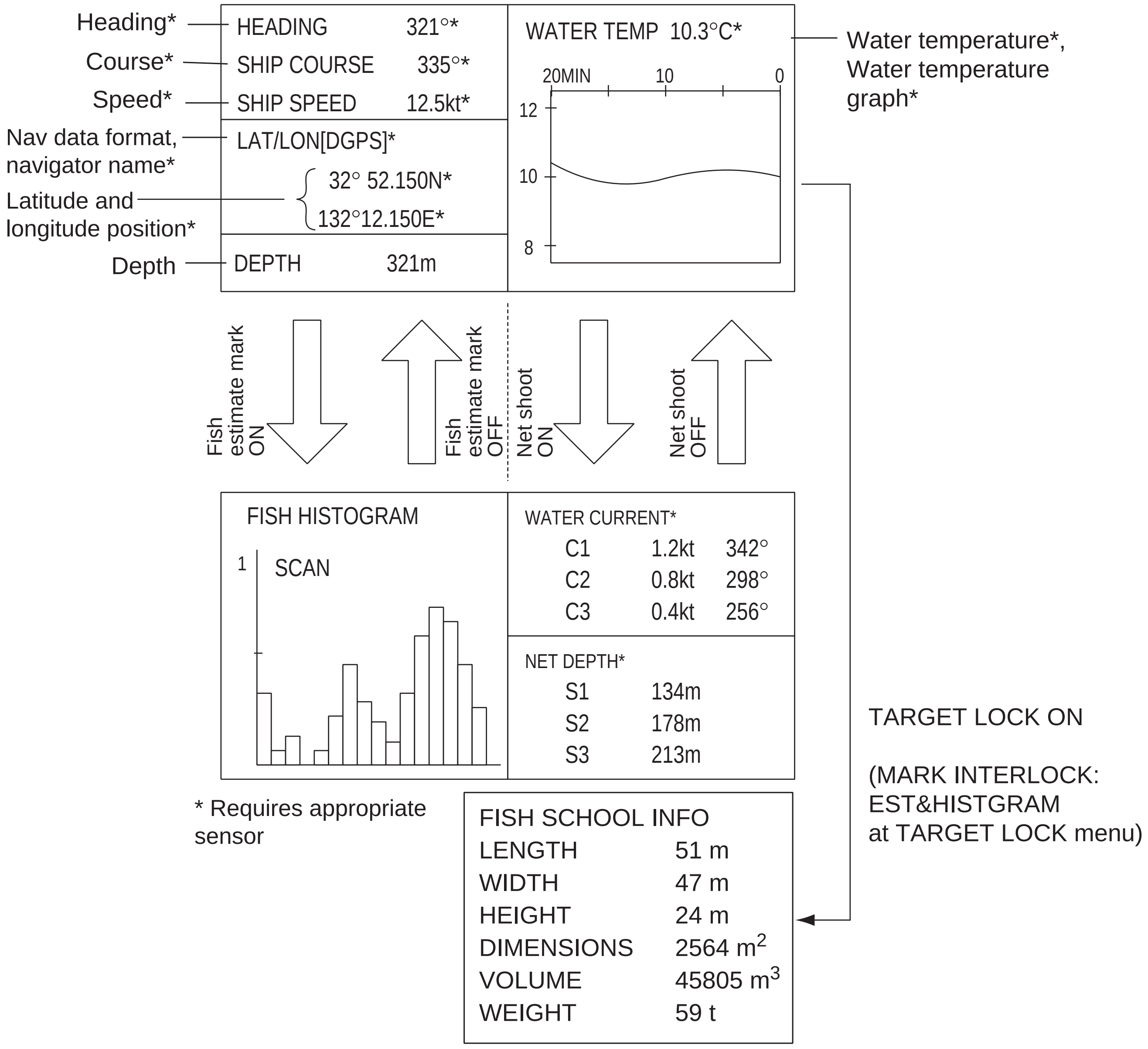


* Requires appropriate sensor.

Full Numeric/graphic data display

7.2 Abbreviated Numeric/Graphic Data Display

This display appears at the top right-hand corner when the history, ES 1 and ES 2 displays are active. The items shown depend on whether the fish estimate mark or net shoot mark is ON or OFF as below.



Abbreviated Numeric/graphic display

Note: Numeric/graphic data may be turned on/off and format selected. For further details see Chapter 9.

7.3 Numeric/Graphic Data Description

When a data is lost its last-entered value is shown in red. Data displays can be turned on or off through the DATA DISPLAY menu.

Numeric/graphic data description

Numeric/ graphic data item	Description	Display range	Available formats	Where to change format
Heading	Shows heading input from heading sensor.	32 comp. pts. 0-359°	32 comp. pts. 360° True	DATA DISPLAY menu
Course	Shows ship's course fed from Numeric/graphic indication.	32 comp. pts, 0-359° 0-359° 1-179° P/S, 0°, 180°	32 comp. pts. 360° True 360° Rel 180° Rel	DATA DISPLAY menu
Speed	Shows ship's speed fed from a Numeric/graphic indication.	0-40 kts	Fixed at knots	
Pos. Sensor	Shows sensor which inputs position data. When there is no position data, only brackets ([ ]) appear.	DPGS, KGPS, FGPS, GPS, LC, DR	GPS Loran -C DR Auto	SYSTEM menu (See your dealer.)
Position	Ship's position in latitude and longitude. If position data is lost the last-entered position is shown in red.	Lat: 90°00.000S-90°00.000N Lon: 179°59.999W-179°59.999E, 180°00.00	L/L	
Current	Shows tide speed and direction for three layers or tide and speed for two layers against a reference layer fed from a current indication.	Cur. Speed: 0-9.9 kt Direction: 0-359°	Direction shown as "flow from," or "flow to."	CURRENT VEC & WIND menu
Depth	Shows depth from transducer to bottom	0-9999m	Meters	
Net Sonde	Depth of net sonde transmitter. Shown only at shooting of net.	0-999m	Depth of up to 3 pts can be displayed.	NET SONDE SETTING menu

(Continued on next page)

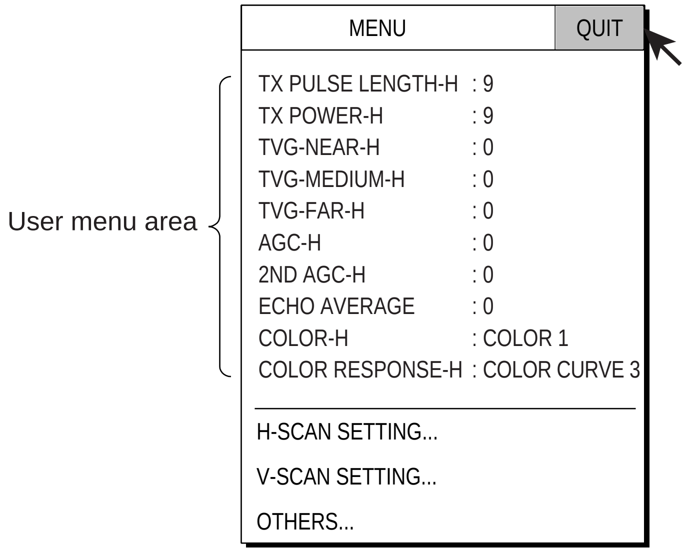
Numeric/graphic data description (con't. from previous page)

Numeric/ graphic data item	Description	Display range	Available formats	Where to change format
Water temp.	Shows water temperature input from a temperature sensor.	-10.0°C to +40.0°C, 14.0° F to 104.0°F	°C, °F	DATA DISPLAY menu
Water temp. graph	Shows water temperature over time. Horizontal axis: 20 min. Vertical axis: °C (°F)	Horizontal axis: Time 20 min (fixed) Vertical axis: Temp. 5°C, 10°F, fixed width, auto shift)	°C, °F	DATA DISPLAY menu
Fish histo-gram	Shows signal strength concentration of fish estimate mark inscribed on horizontal display, echo sounder display	2 marks	For further details see "6. Comparing Fish Concentration".	
Fish school Info.	Shows fish school information during target lock operation.	Length: Distance to fish school in range direction Width: Distance to fish school in bearing direction Height: Vertical distance Dimensions: Horizontal dimension of fish school Volume: Estimated volume of fish school Weight: Estimated tonnage of fish school, calculated from dimension or volume above.		

8. CUSTOMIZING THE EQUIPMENT

8.1 User Menu

You may program 10 often-used menu items to the user menu area in the menu. The default user menu contains pulse length, Tx power, TVG near, TVG medium, TVG far, AGC, 2nd AGC, echo average, color, and color response from the H-SCAN SETTING menu.

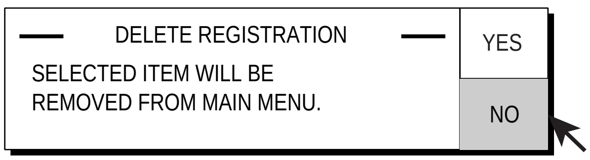


Main menu (user menu)

8.1.1 Deleting items from user menu

The equipment is pre-programmed with ten user menu items. To change the user menu you must first delete a menu item from the user menu which you do not require.

1. Press the [MENU] key to open the main menu.
2. Select the item to delete.
3. Press and hold down the [MENU] key more than one second to show the following dialog box.



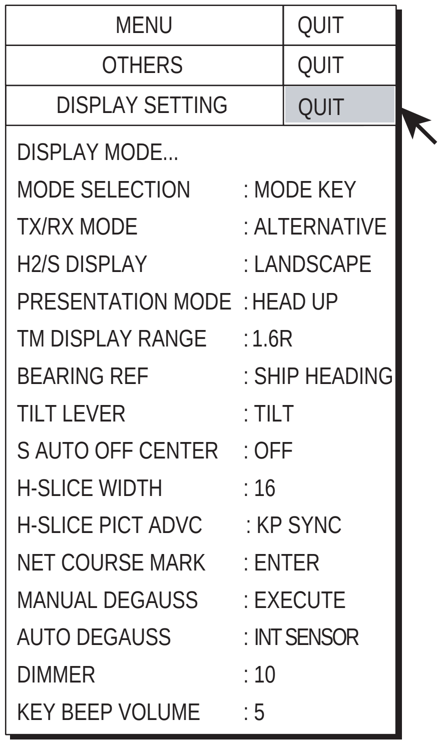
Dialog box for deleting item from user (main) menu

4. Select YES and press the [MENU] key. The dialog box is then closed and the selected item is deleted from the user menu.
5. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

8.1.2 Programming the user menu

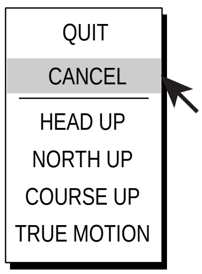
The procedure below shows you how to add the menu item PRESENTATION MODE (for selecting presentation mode) to the user menu. Not all menu items may be programmed to the user menu. See the menu tree on page AP-1 to AP-4 for items which can be programmed. The order of items in the USER menu cannot be changed.

1. Press the [MENU] key to open the main menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.



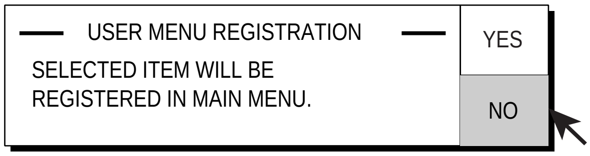
DISPLAY SETTING menu

4. Select PRESENTATION MODE and press the [MENU] key for more than one second. The dialog box appears.



Presentation mode dialog box

After the dialog box disappears the following message appears.



Message for registration of user menu item

Note: If 10 items are already registered to the user menu the following message appears. Delete unnecessary items from the user menu and then repeat this procedure to register different item.



Caution for registration of user menu item

5. Select YES and press the [MENU] key to register item selected to the menu.
6. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

8.2 Function Keys (F1-F6)

The function keys provide one-touch display of desired menu item or entire menu. The default function key settings are as below. Not all menu items and menus may be programmed to the function keys. See the menu tree on page AP-1 to AP-4 for items which may be programmed.

The default settlings are as below:

F1: PICTURE SHOT
Store current picture
F2: RECALL PICTURE
Recall picture in memory
F3: PRESENTATION MODE
Select presentation mode
F4: DIMMER
Adjust panel dimmer
F5: EVENT MARK
Erase event mark
F6: SHIP'S TRACK
Erase ship's track

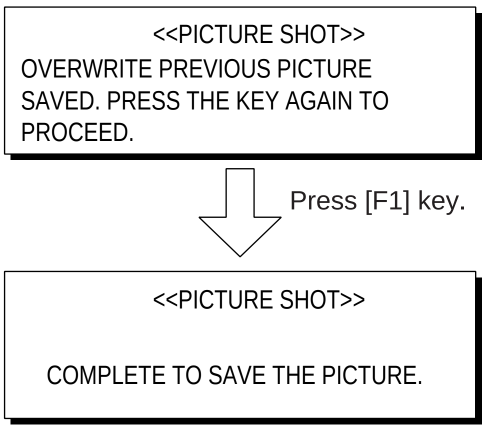
8.2.1 Executing a function

1. Press desired function key. An appropriate dialog box appears.
2. Press the same function key again within five seconds to execute function. (The function dialog box is automatically erased after five seconds.)

Example default function programs

F1: Storing picture

Press the [F1] key twice to save the current picture.



Function dialog box for storing picture

F2: Recalling picture

Press the [F2] key to recall the picture stored in the memory.

<<PLAYBACK MODE>>

PRESS FUNCTION KEY AGAIN TO CANCEL.

Function dialog box for recalling picture

Note: If a picture is not stored, the message “Warning! The picture is not stored” appears.

F3: Presentation mode

Use the [F3] key to select presentation mode.

<<PRESENTATION MODE>>

HEAD UP NORTH UP COURSE UP TRUE MOTION

Dialog box for selection of presentation mode

F4: Panel dimmer

Use the [F4] key to adjust the panel dimmer.

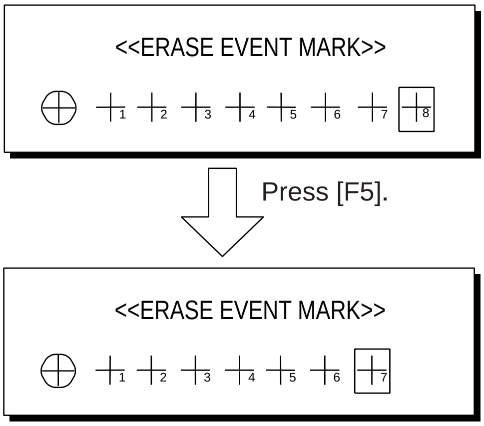
<<DIMMER>>

10

Dialog box for adjustment of panel dimmer

F5: Erase event mark

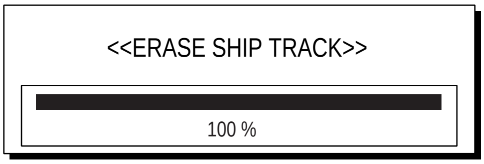
Use the [F5] key to erase event marks successively.



Function dialog box for erasing fish marks

F6: Erase ship's track

1. Press the [F6] key. The following dialog box appears.



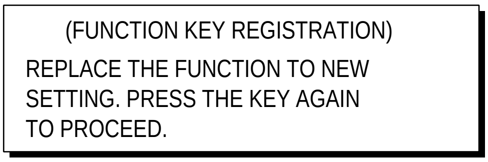
Dialog box for erase ship track

2. Press the [F6] key again. The oldest part of the track will be erased. Each pressing erases approximately 10% of the track.

8.2.2 Programming function keys

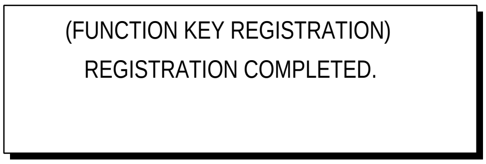
You can change the default setting of a function key as shown below. Note that all menu items may not be programmed to the function keys. See the menu tree on page AP-1 to AP-4 for items which can be programmed for function keys.

1. Press the [MENU] key to open the menu.
2. Display the menu item which you want to assign to a function key.
3. Press desired function key for more than one second. The display shows the following message for five seconds at the top of the screen.



Confirmation for registering function key

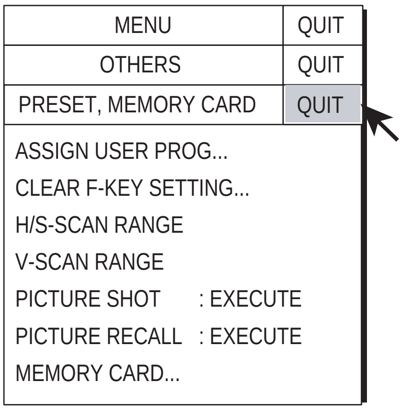
4. Press the same function key again, and the following message appears. This completes the procedure for programming a function key.



Confirmation for registering function key

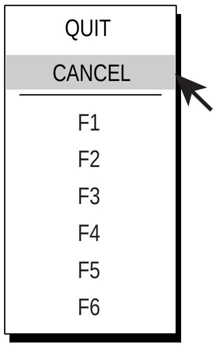
8.2.3 Erasing programs

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select PRESET, MEMORY CARD and press the [MENU] key.



PRESET, MEMORY CARD menu

4. Select CLEAR F-KEY SETTING and press the [MENU] key.
5. Select YES and press the [MENU] key.
6. Select function key for which you want to erase its program.



Function key dialog box

7. Press the [MENU] key.
8. Select QUIT and press the [MENU] key.
9. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

8.3 USER PROG Control

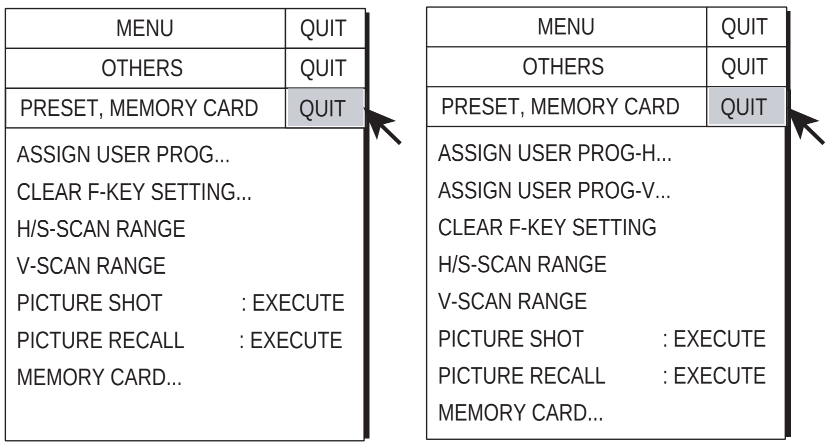
The [USER PROG] control provides for instant setup of the equipment according to fishing ground or target fish. Ten programs may be set up, and vertical and horizontal display settings may be programmed together or individually. (The default settings programs them together.) For how to program them individually see your dealer.

8.3.1 Selecting a user program

Rotate the [USER PROG] control clockwise or counterclockwise to select program desired. Selected program no. appears at the top right-hand corner of the screen to the right of “P”. If the equipment is turned off with a user program active, it starts up with those settings at the next power on.

8.3.2 Programming the USER PROG control

1. Set the equipment as desired. You can set up all items on the H-SCAN SETTING and V-SCAN SETTING menus as desired.
2. Press the [MENU] key to open the menu.
3. Select OTHERS and press the [MENU] key.
4. Select PRESET, MEMORY CARD and press the [MENU] key. One of the following menus appears depending on the setting of “SELECT USER PROG” on the MISC menu of the SYSTEM menu. (For SYSTEM menu, contact your dealer or refer to installation manual.)



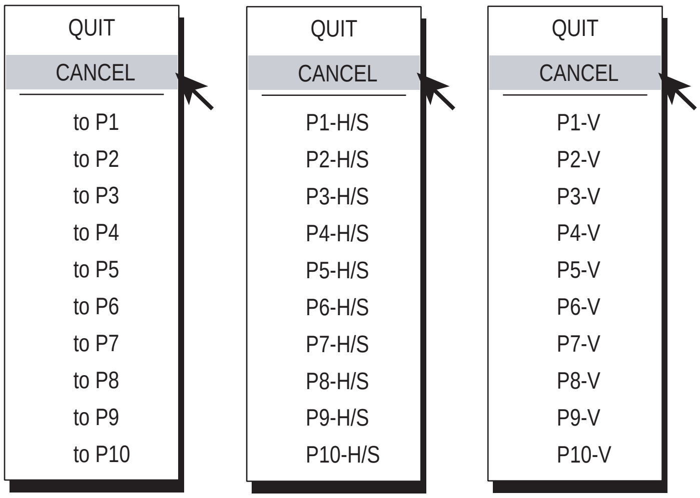
User program set jointly for horizontal and vertical displays

User program set individually for horizontal and vertical displays

PRESET, MEMORY CARD menu

5. Select ASSIGN USER PROG, ASSIGN USER PROG-H/S or ASSIGN USER PROG-V as appropriate and press the [MENU] key.

6. Select YES and press the [MENU] key to confirm the CAUTION indicated. One of the following displays appears depending on your selection.



Horizontal, Vertical Linked　　Horizontal　　Vertical

User program options

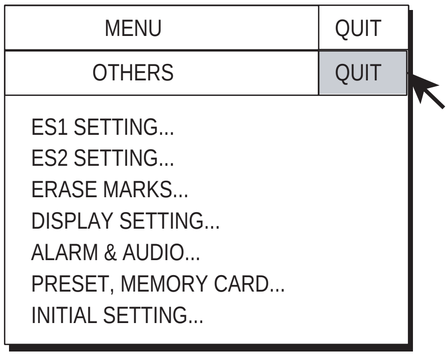
7. Use the trackball to select program no. desired and press the [MENU] key.
8. Select QUIT and press the [MENU] key.
9. Select QUIT at the top of the menu screen and press the [MENU] key to close all menus.

Note: Slant mode user programs are effective when the slant display is selected.
Slant display: user programs for slant mode
Slant combination display: Horizontal display user programs when horizontal display is active.
Slant display user programs when slant display is active.

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9. OTHERS MENU

This chapter provides descriptions for the OTHERS menu, which consists of 16 menus. To display the OTHERS menu, press the [MENU] key, select OTHERS and press the [MENU] key again.



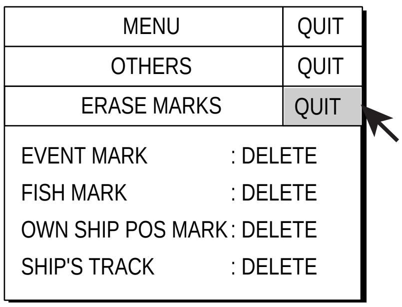
OTHERS menu

Note that the ES1 SETTING and ES2 SETTING menus set up the echo sounder and net recorder displays, respectively. For further details, see Chapter 5.

9.1 ERASE MARKS menu

This menu lets you delete selected marks and track, from earliest to latest.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ERASE and press the [MENU] key.



ERASE MARKS menu

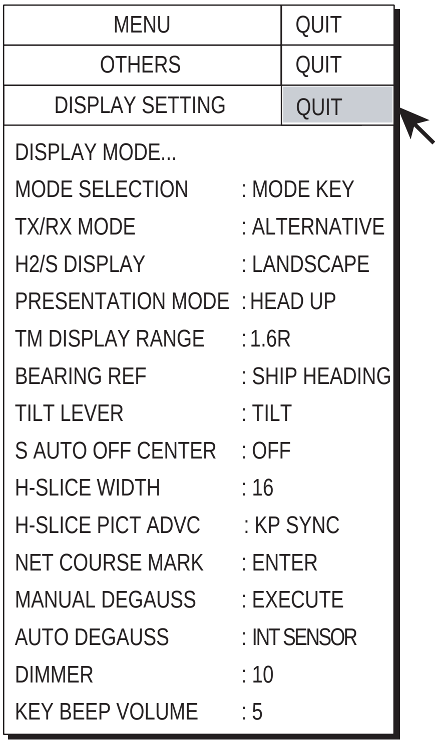
4. Select the mark you want to delete and press the [MENU] key. The earliest mark is deleted. For ship’s track, approximately 10% of the track is erased with each press of the [MENU] key.
5. Press the [MENU] key again to continue deleting mark selected.
6. Select QUIT at the top of the menu screen and press the [MENU] key.

9.2 DISPLAY SETTING menu

The DISPLAY SETTING menu sets various display parameters.

9.2.1 Opening the DISPLAY SETTING menu

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select DISPLAY SETTING and press the [MENU] key.



DISPLAY SETTNG menu

9.2.2 DISPLAY SETTING menu description

DISPLAY MODE: Selects the display modes to use. The default modes are Horizontal, Horizontal1 + Horizontal2, Vertical1, Vertical 1 + Vertical 2, and History.

MODE SELECTION: Determines how display modes are chosen: cyclical pressing of [MODE] key or pull-down menu. The default setting is MODE KEY.

TX/RX MODE: Select how to transmit and receive in combination displays. ALTERNATIVE executes Tx and Rx one display at a time. MULTI simultaneously executes Tx and Rx on each display.

H2/S DISPLAY: Selects the combination mode of two horizontal displays: Landscape, Portrait, Right Inset and Left Inset.

PRESENTATION MODE: Chooses presentation mode. Head-up, north-up, course-up and true motion (requires ship’s speed and heading data) are available, and the default setting is head-up.

TM DISPLAY RANGE: Selects how many times to expand the display range in the true motion mode. 1.3R (R = Range) and 1.6R are available and the default setting is 1.6R.

BEARING REF: Selects how to reference bearing for the vertical bearing marker. The choices are ship's heading (default) and North.

TILT LEVER: Chooses function of the TILT control.

TILT: Sets the tilt only.

TILT & V1: Sets the bearing of the vertical 1 display in the vertical display, and sets the tilt in the horizontal display.

S AUTO OFF CENTER: Choose the train value in automatic own ship position offset in the slant mode. The choices are 30°, 45°, 60° and OFF and the default setting is 45°. AUTO TRAIN must be turned on to activate this function.

H-SLICE WIDTH: Chooses width of the history marker in the history display. The choices are 1, 2, 4 and 8, 16 (default setting) and 32. The higher the number the greater the width.

H-SLICE PICT ADVC: Determines how to advance the history display, by KP SYNC (default setting) or ship's speed.

NET COURSE MARK: Inscribes/deletes the net course mark. For further details see "2.19 Net Course Mark".

MANUAL DEGAUSS: In the default setting the screen is automatically degaussed by the internal sensor when it detects stray magnetic fields on the screen. If you want to degauss the screen manually select MANUAL DEGAUSS and press the [MENU] key. Execute degaussing in intervals; consecutive degaussing may result in color distortion.

AUTO DEGAUSS: Selects how to degauss the screen automatically.

OFF: Turns automatic degaussing off.

TIMER: Degausses at regular intervals.

GYRO: Using heading data from a heading sensor, degaussing occurs when heading change exceeds a certain value.

INT SENSOR: Degaussing occurs when the sensor in the monitor unit detects heading change which exceeds a certain value. This option is only operative on the FURUNO monitor unit FSV-2400.

DIMMER: Adjusts backlighting of the control panel. The setting range is 1-10 and the default setting is 10 (maximum).

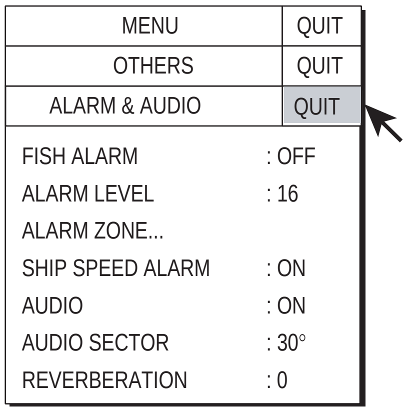
KEY BEEP VOLUME: Sets the volume of the beep which sounds for key operation. The setting range is 0-7. "0" turns off the key beep.

9.3 ALARM & AUDIO menu

9.3.1 Opening the ALARM & AUDIO menu

The ALARM & AUDIO menu sets the fish alarm and the audio bearing mark sector.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select ALARM & AUDIO and press the [MENU] key.



ALARM & AUDIO menu

9.3.2 ALARM & AUDIO menu description

FISH ALARM: Turns the fish alarm function on or off. The default setting is off.

ALARM LEVEL: Sets the minimum echo color which triggers the fish alarm. The setting range is 0-30 and the default setting is 16.

ALARM ZONE: Sets fish alarm zone. For further details see “2.14 Fish Alarm”.

SHIP SPEED ALARM: The default setting is on. So if the ship speed exceeds limit speed (See page 11-5) during transducer raising/lowering or being extended the buzzer sounds. You can set this alarm deactivated.

AUDIO: Turns the audio function on (default setting) or off. For further details see “2.12 Detecting Fish Schools Aurally”.

AUDIO SECTOR: Choose audio sector width for use with audio function. The choices are 0°, 60°, 90°, 180° and 330°. For further details see “2.12 Detecting Fish Schools Aurally”.

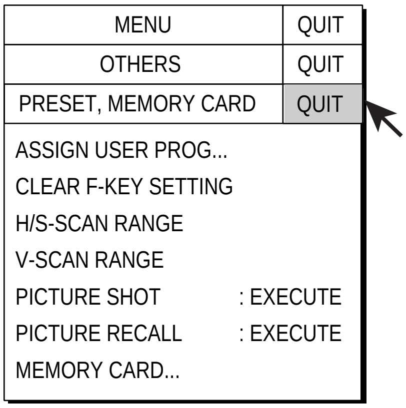
REVERBERATION: Chooses length of reverberation for audio signal. The setting range is 0-9 and the default setting is 0 (no reverberation). The larger the value the longer the reverberation.

9.4 PRESET, MEMORY CARD menu

9.4.1 Opening the PRESET, MEMORY CARD menu

This menu presets various functions and provides memory card operations.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select PRESET, MEMORY CARD and press the [MENU] key.



PRESET, MEMORY CARD menu

9.4.2 PRESET, MEMORY CARD menu description

ASSIGN USER PROG: Programs the USER PROG control. For further details see “9.3 USER PROG Control”.
Note: In the default setting any user program adjusts the horizontal and vertical displays together. Individual programming for the horizontal and vertical displays is also available. For further details contact your dealer.

CLEAR F-KEY SETTING: Erases program assigned to a function key. For further details see “8.2.3 Erasing programs”.

H/S-SCAN RANGE: Presets the horizontal and slant mode ranges as selected with the [RANGE] control. The setting range is 60-2000 m.

V-SCAN RANGE: Presets the vertical scan ranges as selected with the [RANGE] control. The setting range and default settings are the same as that for H-SCAN RANGE.

PICTURE SHOT: Temporarily stores current picture. For further details see “2.21 Storing, Recalling Picture”.

PICTURE RECALL: Replays picture stored in memory. For further details see “2.21 Storing, Recalling Picture”.

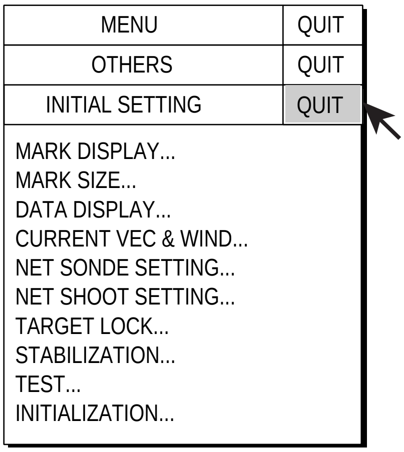
MEMORY CARD: Memory card operations. For further details see Chapter 10.

9.5 INITIAL SETTING menu

9.5.1 Opening the INITIAL SETTING menu

This menu provides 10 sub menus which perform such tasks as mark configuration and size.

1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select INITIAL SETTING and press the [MENU] key.
4. Select YES and press the [MENU] key to confirm the CAUTION indicated. The following menu appears.



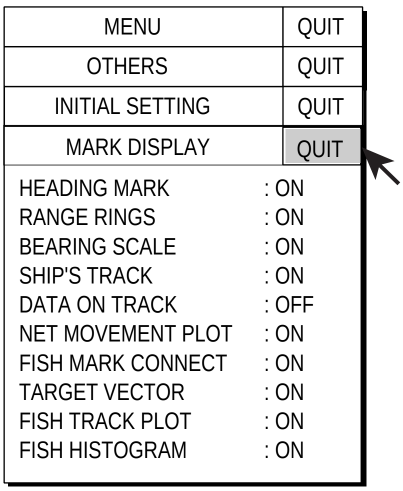
INITIAL SETTING menu

The TARGET LOCK menu is described in section 2.11. For the TEST menu, see to Chapter 11.

9.5.2 INITIAL SETTING menu description

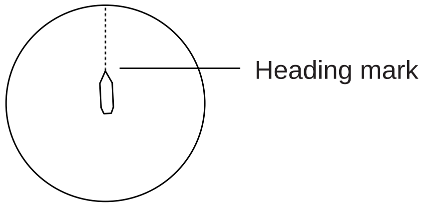
MARK DISPLAY menu

This menu turns on/off marks on the horizontal display. All items except DATA ON TRACK are turned on in the default setting.



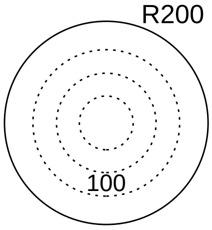
MARK DISPLAY menu

HEADING MARK: The heading mark is a dashed line which indicates the heading in all presentation modes. It extends from own ship position to the outer edge of the display and appears at zero degrees in the head-up mode. It changes the orientation depending on ship's orientation in the north-up, course-up and true motion modes.



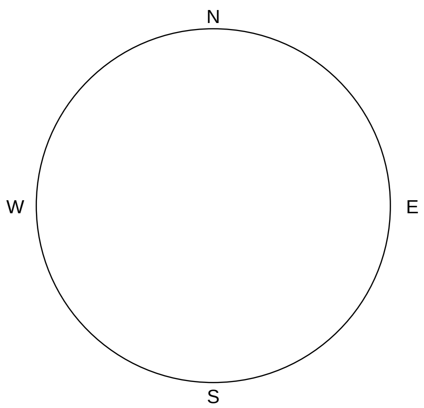
Heading mark

RANGE RINGS: The range rings are the dotted line circles about own ship, and they provide an estimate of the range to a target. Rings appear every distance of 1/2 or 1/4 of the range depending on menu setting.



Range rings

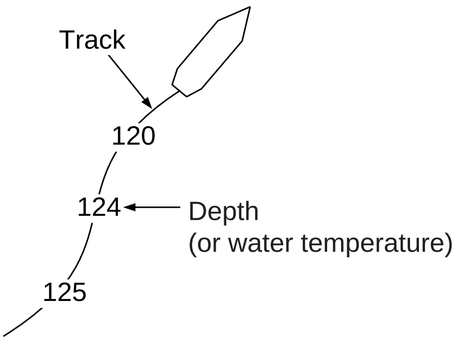
BEARING SCALE: The bearing scale is the concentric solid circle at the edge of the display. It provides an estimate of the bearing to a target.



Bearing scale

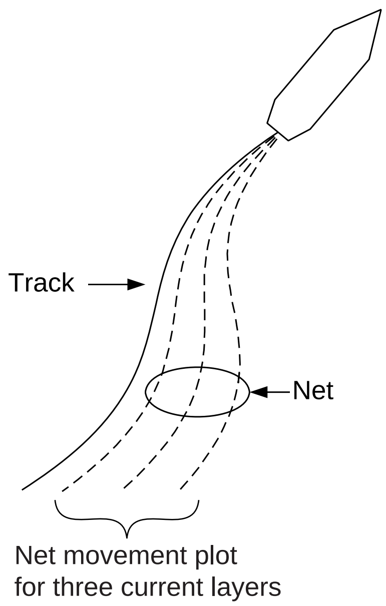
SHIP'S TRACK: Traces ship's movement with a solid line. When the capacity of the track memory is exceeded the earliest track is automatically erased to trace new track. Requires ships speed and course data.

DATA ON TRACK: Shows depth or water temperature on the ship's track. The display range for temperature and depth are
Water Temperature: -10°C to 40.0°C (+14°F to 105.0°F)
Depth: 0 to 9999 m



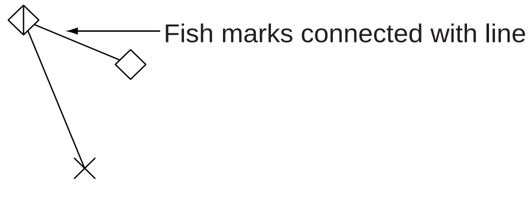
Data on ship's track

NET MOVEMENT PLOT: Shows predicted net movement against three current layers over time. Automatically turned on or off with the net shoot mark.



Net movement plot

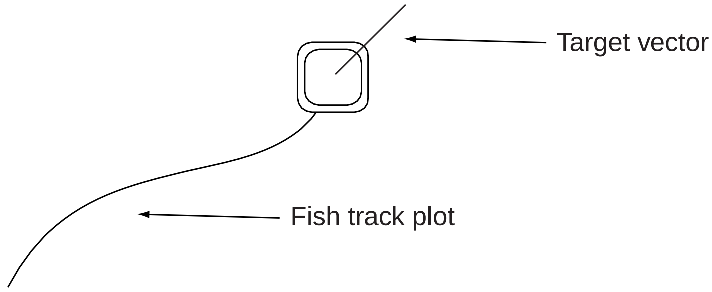
FISH MARK CONNECT: You may connect fish marks with a line to show the order in which they were entered.



Fish marks connected with line

TARGET VECTOR: This is a line extending from target lock mark which shows speed and direction of tracked fish school. See the illustration below for appearance.

FISH TRACK PLOT: Traces target movement in target lock. Requires ship's speed and course data.



Target lock mark

FISH HISTOGRAM: Shows signal strength distribution for the fish school(s) marked with an estimate mark on the horizontal or echo sounder display. For further details see page 5-14.

MARK SIZE menu

This menu lets you select the size or the marks appearing on the horizontal display.

MENU	QUIT
OTHERS	QUIT
INITIAL SETTING	QUIT
MARK SIZE	QUIT
TRACKBALL MARK	: +SMALL
TARGET LOCK MARK	: SMALL
TARGET VECTOR	: NORMAL
EVENT MARK	: LARGE
FISH MARK	: LARGE
OWN SHIP POS MARK	: SMALL
OWN SHIP MARK	: ACTUAL
NET SHOOT MARK	: SMALL
ESTIMATE ON SCAN	: LARGE
ESTIMATE ON ES	: 1/8
CURRENT VECTOR	: SHORT
RANGE RINGS	: 1/4R
SHIP'S TRACK MARK	: 5R

MARK SIZE menu

TRACKBALL MARK: Selects size and appearance of trackball mark. The choices are large and small "+" mark, and large and small "■" mark.

TARGET LOCK MARK: The target lock mark size is available in large and small.

TARGET VECTOR: You may display the target vector in short, normal or long lengths. Set “long” for slow moving target and “short” for faster moving target.

EVENT MARK: Chooses event mark size; large or small.

FISH MARK: Displays the fish mark in large or small size.

OWN SHIP POS MARK: Shows the own ship position mark in large or small size.

OWN SHIP MARK: Selects size of own ship mark to standard, large or actual.

NET SHOOT MARK: You may show the net shoot mark in large or small size.

ESTIMATE ON SCAN: Selects the size of the fish estimate mark on the horizontal display for large or small.

ESTIMATE ON ES: Selects width of fish school concentration calculation area on the echo sounder display. The choices are 1/8, 1/4 and 1/2 of the echo sounder depth range.

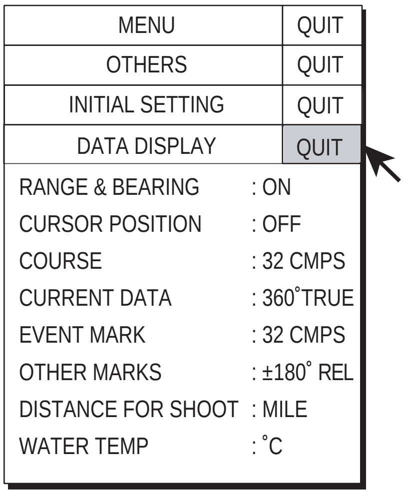
CURRENT VECTOR: The length of the current vector may be set to short or long.

RANGE RINGS: Selects the range ring interval; 1/4R or 1/2R (R = Range).

SHIP’S TRACK MARK: Selects the amount of track to display; 5R, 10R, 20R, 40R (R = Range).

DATA DISPLAY menu

This menu sets the readout format for marks on the display.
Default settings are shown in the illustration below.



DATA DISPLAY menu

RANGE & BEARING: Turns on/off the range and bearing data which appears when the range and bearing marks are turned on.

CURSOR POSITION: Turns on/off the cursor position (latitude and longitude) display. Requires navigation data.

COURSE: Selects how to display course: 32 compass points, 360 ° True, 360° Relative, 180° Relative.

CURRENT DATA: Selects how to display tidal current data; 32 compass points, 360 ° True, 360° Relative, 180° Relative.

EVENT MARK: Selects how to display event mark data; 32 compass points, 360 ° True, 360° Relative, 180° Relative.

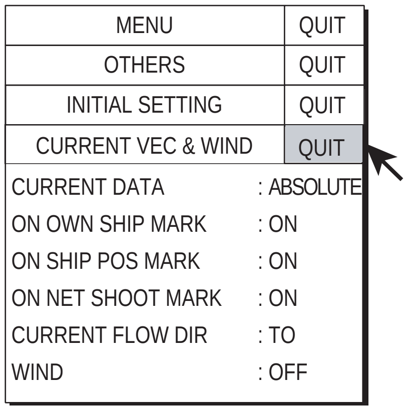
OTHER MARKS: Selects how to display other mark data; 32 compass points, 360 ° True, 360° Relative, ±180°. ±180° shows xxxS in case of starboard direction; xxxP in case of port direction. True indications require heading sensor. 32 compass points shows bearing with alphabet indication, for example, “NNE”.

DISTANCE FOR SHOOT: Selects the distance run unit to show the distance run after shooting the net. The choices are miles, meters and feet.

WATER TEMP: Chooses water temperature unit; in °C (Celsius) or °F (Fahrenheit).

CURRENT VEC & WIND menu

This menu sets up tidal current and wind data.



CURRENT VEC & WIND menu

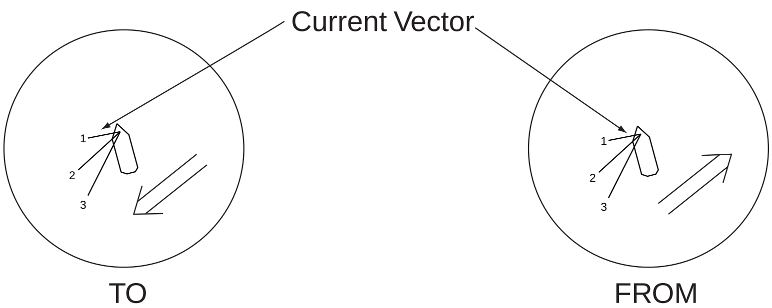
CURRENT DATA: Chooses how to display current data; absolute or in relation to layer 1, layer 2 or layer 3.

ON OWN SHIP MARK: Selects whether to show the current mark on the own ship mark or not.

ON SHIP POS MARK: Selects whether to show the current mark on the own ship position mark or not.

ON NET SHOOT MARK: Selects whether to show the current mark on the net shoot mark or not.

CURRENT FLOW DIR: Chooses how to display current data. FROM shows from what direction the current is flowing; TO shows the direction the current is heading. Requires connection of a current indicator.

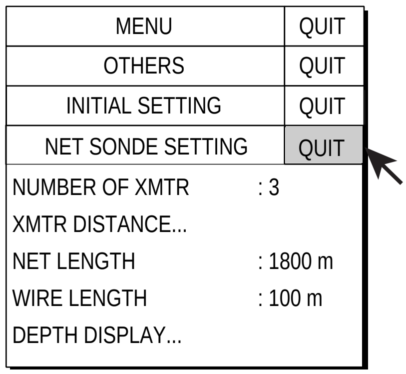


Current flow direction settings

WIND: Selects wind display; off, relative wind data or true wind data.

NET SONDE SETTING menu

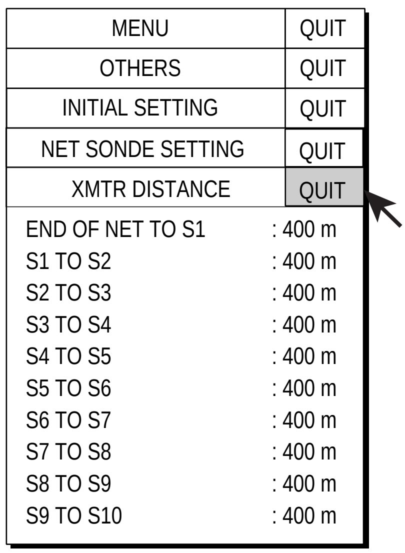
This menu sets up the net sonde (option).



NET SONDE SETTNG menu

NUMBER OF XMTR: Sets number of transmitter units used, from 0-10.

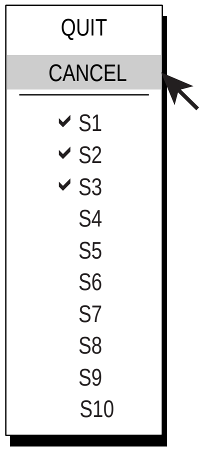
XMTR DISTANCE: Sets the distance between transmitters. Select this item and press the [MENU] key to set the distances.



XMTR DISTANCE setting window

NET LENGTH: Sets net length in increments of 100 m. Setting range is 500 m to 3000m.

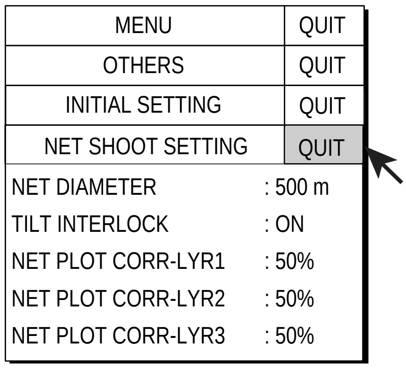
DEPTH DISPLAY: Selects which sonde depth data to show. Select this item and press the [MENU] key to select net sondes. The check mark shows current selection (Max. 3).



DEPTH DISPLAY menu

<u>NET SHOOT SETTING menu</u>

Sets up net shoot parameters.



NET SHOOT SETTING menu

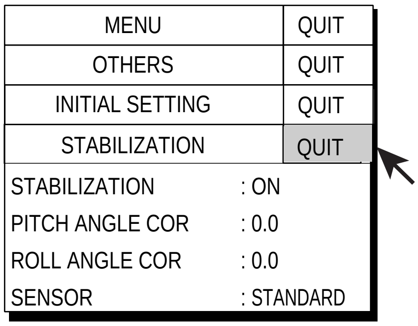
NET DIAMETER: Sets net diameter in increments of 10 meters. Setting range is 200 m to 1000 m.

TILT INTERLOCK: Turns on/off interlocking of diameter of net course mark with tilt angle.

NET PLOT CORR-LYR-1, -2, -3: The movement of the net during net shooting is plotted using water current speed and direction fed from a current indicator. The current indicator feeds that data for three depths (layers), thus net movement will be different at each layer. Determine degree of difference among layers considering net, sea conditions, etc. If 50% is set, for example, the net movement plot mark moves at speed of 50% of water current speed.

STABILIZATION menu

This menu compensates for pitching and rolling.



STABILIZATION menu

STABILIZATION: Turns stabilization on/off.

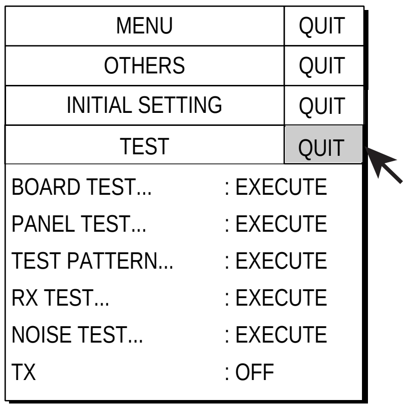
PITCH ANGLE COR: Offsets pitch angle error generated by motion sensor.

ROLL ANGLE COR: Offsets roll angle error generated by motion sensor.

SENSOR: Select type of motion sensor used, standard or GPS gyro.

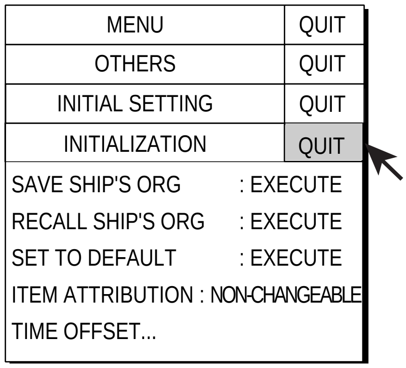
TEST menu

This menu conducts various tests. For further details, see Chapter 11.



INITIALIZATION menu

This menu restores default settings and offsets time to use local time.



INITIALIZATION menu

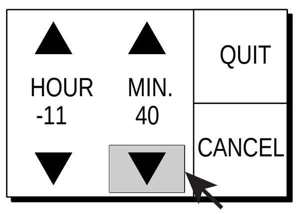
SAVE SHIP'S ORG: All menu settings are saved. See note below.

RECALL SHIP'S ORG: Recall the menu settings which have been saved above. See note below.

SET TO DEFAULT: Restore all default menu settings. See note below.

ITEM ATTRIBUTION: Locks/unlocks protected menu settings.
Note: Cannot be changed even if set to CHANGEABLE.

TIME OFFSET: Memory card files are "stamped" with the time fed from external equipment (for example, a GPS navigator), whose time may be different from local time. If you want your files to be stamped with the local time set the time difference between the time source and local time on this menu item. The setting range is –13:59 to 13:59.



Time offset dialog box

10. MEMORY CARD OPERATIONS

This chapter provides the information necessary for using the memory cards, which provide for storage of pictures and configurations (settings).

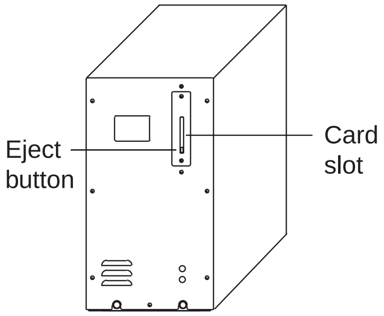
10.1 Storing Image, Configuration

The memory card can store up to 49 files for image data (max 32 files) and configuration data (max 32 files), depending on card's memory capacity and size of image file. Configuration files store current settings, and they can be replayed to set up the equipment according to fishing ground or target fish.

The date and time a file is stored is shown in the file list. If there is no time or date input when a file is stored the file's date and time line shows 2000/01/01 as the date and 00:00-99:99 as the time.

Note: Before storing image or configuration to a memory card, you should store it into the internal memory. See section 2..21 for the procedure.

1. Remove the lid at the front of the processor unit.
2. Insert a memory card face right in the card slot in the processor unit.

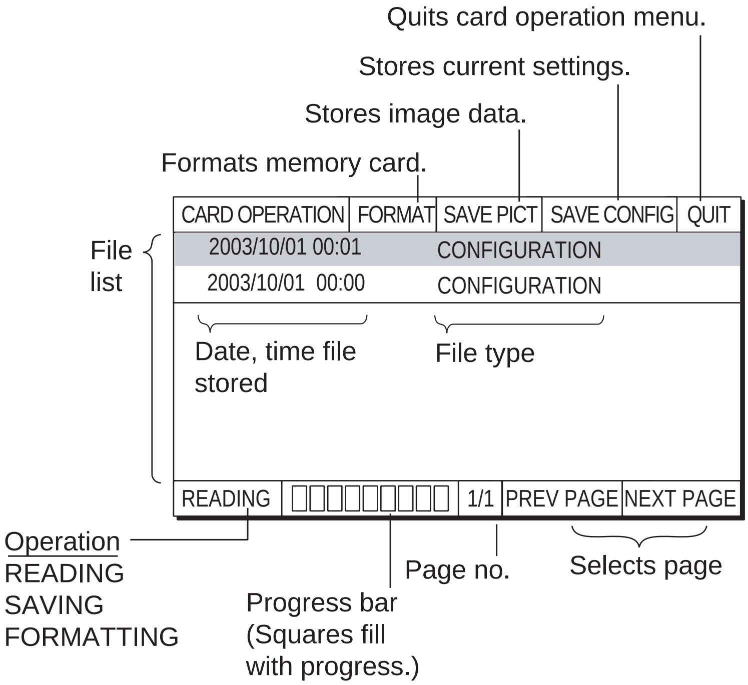


Processor unit

3. Press the [MENU] key to open the menu.
4. Select OTHERS and press the [MENU] key.
5. Select PRESET, MEMORY CARD and press the [MENU] key.

6. Select MEMORY CARD and press the [MENU] key.

   Note: Never remove a memory card while the access lamp (red) is lit.



MEMORY CARD menu

7. Select SAVE PICT or SAVE CONFIGURATION as appropriate and press the [MENU] key to store item selected.
8. Select QUIT and press the [MENU] key.

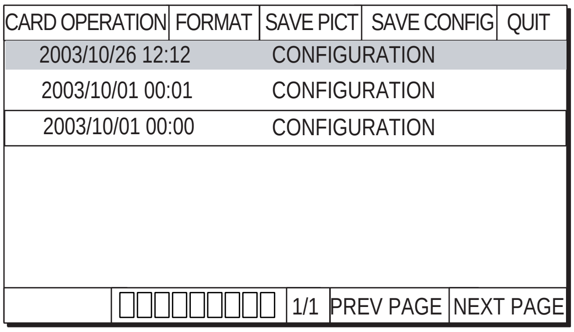
Note: If the following message appears, there is not enough space on the memory card. Delete undesired files, referring to the next section, and try again.

NOT ENOUGH SPACE IN MEMORY CARD.
DELETE UNDESIRED FILES, AND TRY AGAIN.

10.2 Loading, Deleting Files

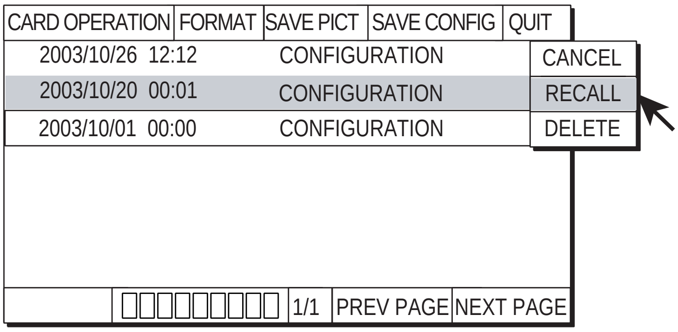
This section shows you how to load and delete files. You may load files on the display to analyze echoes. When a memory card becomes full, you may wish to delete unnecessary files.

1. Insert memory card.
2. Press the [MENU] key to open the menu.
3. Select OTHERS and press the [MENU] key.
4. Select PRESET, MEMORY CARD and press the [MENU] key.
5. Select MEMORY CARD and press the [MENU] key.



MEMORY CARD menu

6. Select a file and press the [MENU] key.



MEMORY CARD menu, recall, delete dialog box opened

7. Select RECALL or DELETE as appropriate and press the [MENU] key. When you select RECALL, the setting is loaded. Then, rotating the [USER PROG] control change a user program.
8. Select QUIT and press the [MENU] key.

When RECALL is selected, the file from the memory card is now loaded into the internal memory. If you want to display the image loaded, refer to “2.21.1 Recalling stored picture”.

10.3 Formatting Memory Cards

Formatting prepares the memory card for use with the system. Note that if you erase the contents of a memory card it must be re-formatted.

1. Insert a formatted memory card in the memory card slot in the processor unit.
2. Press the [MENU] key to open the menu.
3. Select OTHERS and press the [MENU] key.
4. Select PRESET, MEMORY CARD and press the [MENU] key.
5. Select MEMORY CARD and press the [MENU] key.
6. Use the trackball to select FORMAT and press the [MENU] key.
   The message “FORMAT MEMORY CARD. THE FILES SAVED IN CARD WILL BE DELETED” appears.
7. Select FORMAT to format (or CANCEL to escape) and press the [MENU] key.
8. Select QUIT and press the [MENU] key.

11. MAINTENANCE, TROUBLESHOOTING

This chapter provides information necessary for keeping the equipment in good working order.

⚠ WARNING

Do not open the equipment.

Hazardous voltage which can cause electrical shock exists inside the equipment. Only qualified personnel should work inside the equipment.

11.1 Preventive Maintenance

Check the following points monthly.

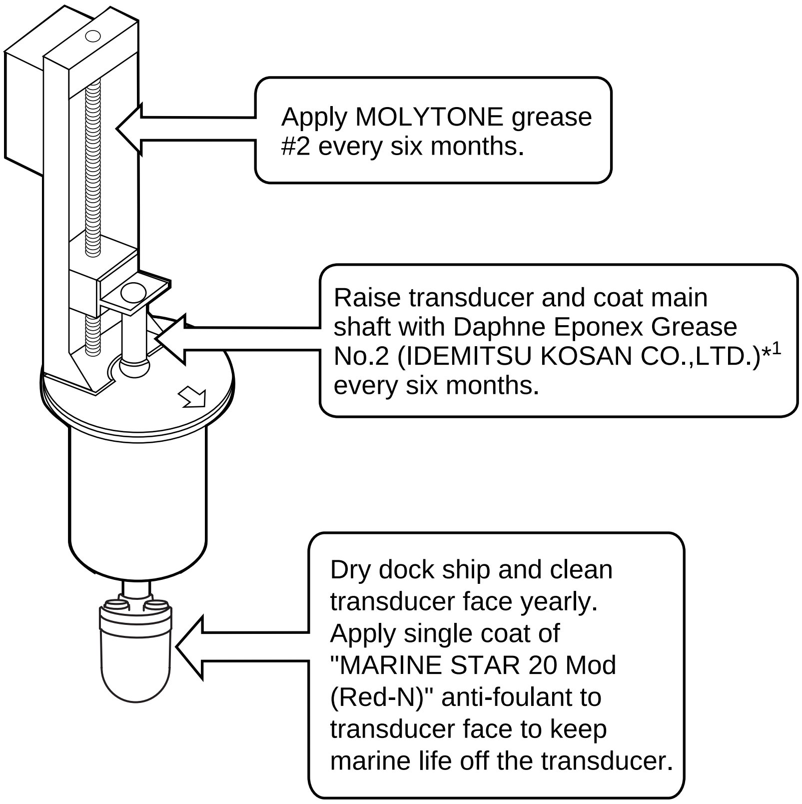
- Check all cables. If damaged, replace.
- Check connectors at rear of each unit. If loosened, reconnect.
- Check earth of each unit. Clean if necessary.
- Check voltage of ship’s mains to be sure it is within the equipment’s power rating.

Cleaning the equipment

Dust or dirt can be removed from the equipment with a soft, dry cloth. Do not use chemical cleaners to clean the equipment – they can remove paint and markings.

11.2 Hull Unit Maintenance

Follow the points mentioned below to keep the hull unit in good working order.



Hull unit maintenance

*[1]: Equivalent greases:

- SHOWA SHELL OIL: Shell Albania Grease S No.2
- EXXON MOBIL: Mobilux EP No.2
- NIPPON OIL CORPORATION: Multinox Grease No. 2

⚠ CAUTION

Replace anticorrosion zinc plate yearly.

Corrosion between the main shaft and transducer may result, allowing water leakage and/or loss of transducer.

11.3 Fuse Replacement

The fuses in the processor unit, transceiver unit and hull unit protect them from overcurrent and equipment fault. If the power cannot be applied, first check the fuse in the processor unit and transceiver unit. If the power still cannot be turned on, have a qualified technician check the fuses in other units.

Unit and fuse

Unit	Fuse rating
Processor unit	FGB0 10 A 250 VAC (2 pcs.)
Transceiver unit	FGB0 20 A 250 VAC (2 pcs.) For 100/110/115 VAC
	FGB0 10 A 250 VAC (2 pcs.) For 220/230 VAC
Transceiver unit (B voltage power section)*	FGBO 15 A 250 VAC (2 pcs.)
Transceiver unit (DC power section)*	FGMB 5 A 250 VAC (2 pcs.)
Hull unit*	FGMB 2 A 250 VAC (1 pc.)

* Fuse cannot be replaced by operator.

⚠ WARNING

Use the proper fuse.

Use of a wrong fuse can cause fire or damage the equipment.

11.4 Troubleshooting

The table below provides common symptoms of equipment troubles and the means to rectify them.

Troubleshooting

Symptom	Check, Remedy
Cannot turn on the power.	• Check cables between transceiver unit, processor unit and monitor unit. • Check ship's mains. • Have a suitably qualified technician check the fuse in the transceiver unit.
Bottom echo becomes irregular.	• Rough seas. Distance to the bottom changes due to rolling and pitching. • Long range selected. Transmission period is longer so ship's pitching and rolling are apt to affect detection of echo.
Weak echo	• Output power set to minimum. Set to maximum, on the H-SCAN SETTING menu. • Excessive TVG. Readjust TVG on the appropriate menu (H-SCAN SETTING, V-SCAN SETTING). Note that readjustment of TVG is necessary when gain is adjusted.
Somewhat strange color	• Brilliance setting too low. Increase brightness with the [BRILLIANCE] control.
Picture contains noise.	• Equipment not grounded properly. Check equipment ground. • Power cable is too close to the signal cable. Relocate power cable or signal cable. • Debris may be on sea surface. Reject unwanted noise with the interference rejector on the appropriate menu among H-SCAN SETTING, V-SCAN SETTING.

11.5 Warning Messages

The table below shows the warning messages which may appear on the display. All warning messages are accompanied by an audio alarm, which you may silence with the [R/B AUDIO] key.

Error messages

Message	Meaning, Remedy
Power supply	
OVERVOLTAGE!! RETRACT TRANSDUCER AND TURN OFF POWER. CHECK SHIP'S MAINS VOLTAGE. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when the voltage supplied to the transceiver unit is excessive. Transmission is stopped if the equipment is transmitting, to protect the transducer and transmitter power section from damage. Silence the buzzer with the [R/B AUDIO] key, retract the transducer and turn off the power. Have a qualified technician check input voltage.
Transceiver unit	
NO RESPONSE FROM TRANSCEIVER UNIT. TURN OFF AND ON POWER AGAIN, OR CHECK POWER LINE TO TRANSCEIVER UNIT. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when there is no reply from the transceiver unit. Press the [R/B AUDIO] key to turn off the buzzer. Have a qualified technician check the set.
ELECTRIC CHARGE!! RETRACT TRANSDUCER AND TURN OFF POWER. CHECK SHIP'S MAINS VOLTAGE. PRESS R/B KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds if the +B voltage of capacitors in the transceiver unit can not be charged to predetermined voltage within the specified time. Press the [R/B AUDIO] key to silence the buzzer. Have a qualified technician check the set.
OVER TEMPERATURE!! RETRACT TRANSDUCER AND TURN OFF POWER. PRESS R-B KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when the temperature in the power supply block has exceeded 85°C. Press the [R/B AUDIO] key to silence the buzzer. Turn off the unit and have a qualified technician check the set.
Hull unit, transducer	
TRANSDUCER NOT RETRACTED!! CUT OFF POWER LINE TO MONITOR UNIT AND HULL UNIT. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center, the buzzer sounds and the LEDs above keys blink if the transducer is not raised within 26 seconds for 800 mm stroke or 33 seconds for 1100 mm stroke of pressing the [↑] key. Press the [R/B AUDIO] key to silence the buzzer. The reason may be the transducer is tangled in the net or its shaft is bent. Try raising it from the hull unit as shown in section 11.9.

Error messages (con’t from previous page)

Message	Meaning, Remedy
Hull unit, transducer (con’t)	
WARNING!! TRANSDUCER IS KEPT AT WRONG POSITION. SET BACK TRANSDUCER POSITION TO NORMAL BY USING ↑ OR ↓ KEY. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when the transducer is knocked out of position in any aspect of its operation. Try to return the transducer to its normal position by operating the [↑] or [↓] key and silence the buzzer with the [R/B AUDIO] key.
WARNING!! TRANSDUCER IS KEPT EXTENDED. MAX ALLOWABLE SPEED FOR EXTENDED TRANSDUCER IS 18 KT. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when the transducer is extended and ship’s speed, input by external equipment, exceeds 18 kts. Silence the buzzer with the [R/B AUDIO] key and lower ship’s speed.
WARNING!! MAX ALLOWABLE SPEED DURING RAISING/LOWERING TRANSDUCER IS 15 KT. PRESS [R/B] KEY TO TURN OFF ALARM.	This message blinks at the screen center and the buzzer sounds when the transducer is raised/lowered and ship’s speed, input by external equipment, exceeds 15 kts. Silence the buzzer with the [R/B AUDIO] key and lower ship’s speed.

11.6 Error Codes

The equipment displays a (blinking) three-digit error code at the bottom of the display when it detects internal trouble. In case of multiple error, error codes appear in numerical order and the maximum number of codes displayable is five. The codes remain on the screen until the corresponding trouble is fixed, and a buzzer sounds each time a new error code is added to the on-screen error code display. For any error code, report error code number to your dealer.

```
* * * Error Code * * *      #003, #006, #108
```

Error code

11.7 Status Messages

Status messages appear at the screen center to alert the operator. These are as below.

Status messages and their meanings

Status message	Meaning
TX OFF	Transmission turned off from the menu.
RAISE/LOWER TEST*	Raise/lower command received from the control unit in normal operation, to manually test raise/lower switch in hull unit. Raise/lower keys on the control unit are inoperative during the hull unit test.

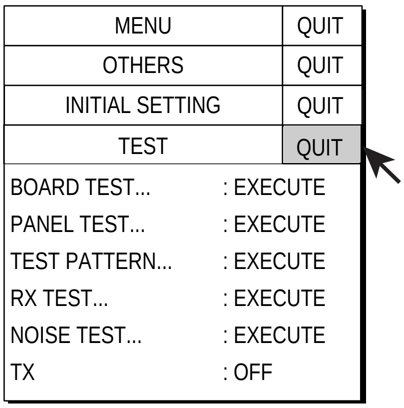
* = Not displayed when TX is OFF.

11.8 Tests

A comprehensive diagnostic facility is provided for testing the equipment. If NG (no good) or abnormal display appears in the test results for any test, contact your dealer.

11.8.1 TEST menu

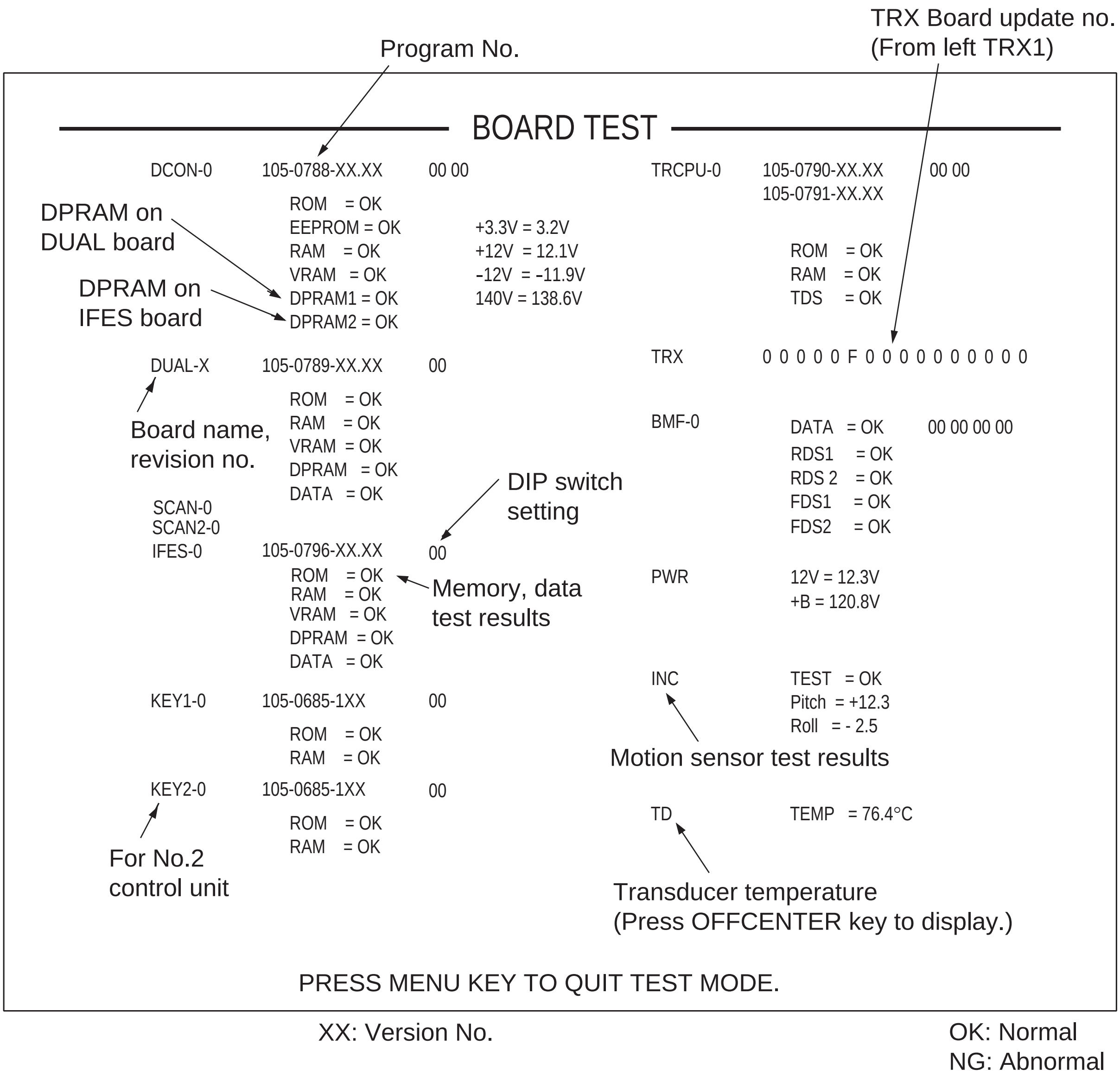
1. Press the [MENU] key to open the menu.
2. Select OTHERS and press the [MENU] key.
3. Select INITIAL SETTING and press the [MENU] key.
4. Select TEST and press the [MENU] key to open the TEST menu.



TEST menu

11.8.2 Board test

Select BOARD TEST from the TEST menu and press the [MENU] key to do this test.



Board test results

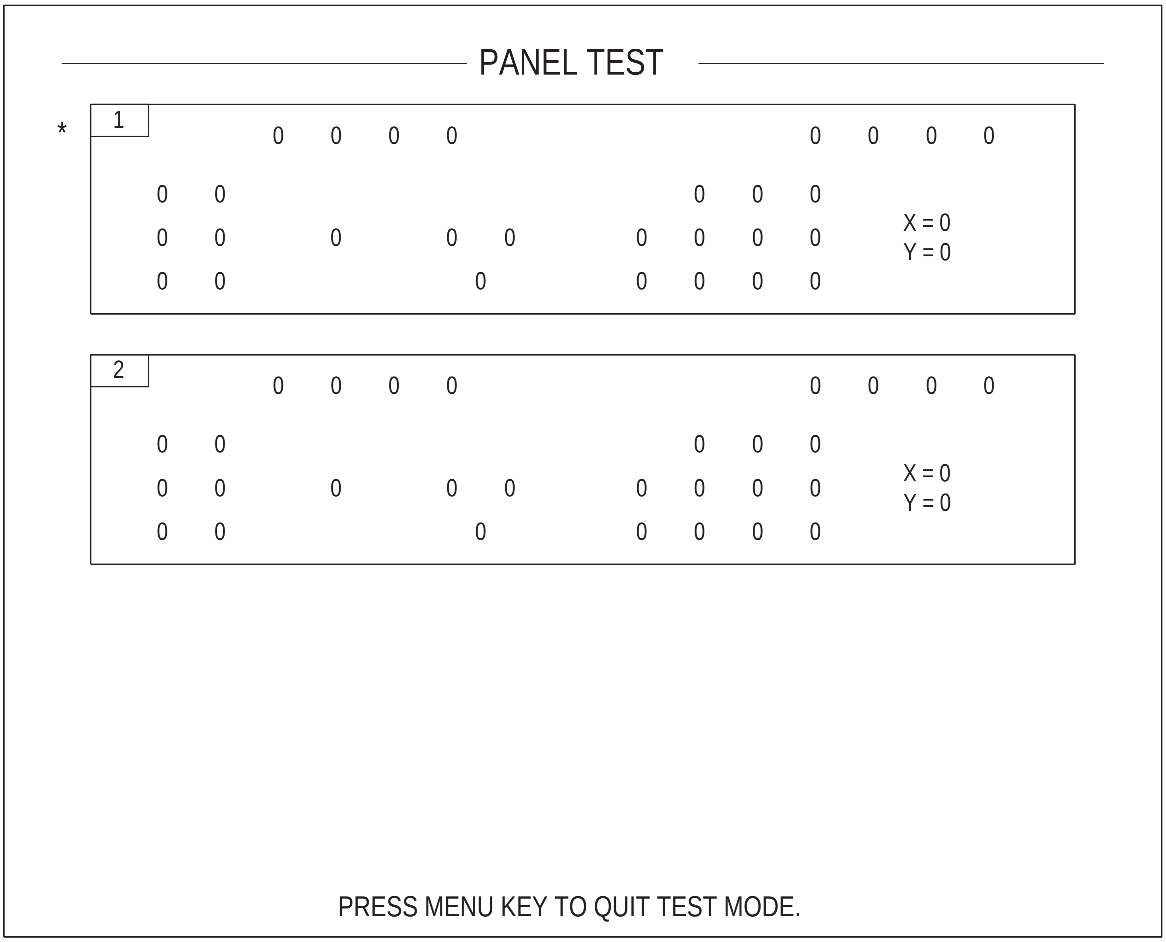
For any NG, contact your dealer for advice.

Interpreting the board test results

- **Board name and its revision no.** are shown in white. If a board is not inserted or inserted improperly “F” is shown as program number. When a revision no. is improper a hexadecimal from 0-E appears. When an error is found, revision no. and board name appear in red.
- **Program no**. is shown in white, or red when software finds revision no. error.
- **DIP switch setting** on each board is shown.
- **Memory read/write test results** are shown as OK (white) or NG (red).
- **Test data check results** are shown as OK (white) or NG (red).
- **TX +B voltage** is measured and displayed.
- **Motion sensor test results** show OK (white) or NG (red) as overall results and pitch and roll angles.
- **KEY 2-0** will be displayed only when two control units are installed.

11.8.3 Panel test

This test checks the keys, controls and trackball of the control unit. Select PANEL TEST from the TEST menu and press the [MENU] key to do this test.



PANEL test

Key check: Press each key one by one. A key is normal if its corresponding on-screen location shows “1” while the key is pressed and “0” when the key is released. The power keys (ON and OFF) can not be checked.

Control check: Operate each control one by one. A control is normal if rotating clockwise indicates positive, and counterclockwise, negative. The [BRILLIANCE] control, [AUDIO] control and the [POWER] switches cannot be checked.

*: When two control units are connected, 1 is for main control unit and 2 is for sub control unit.

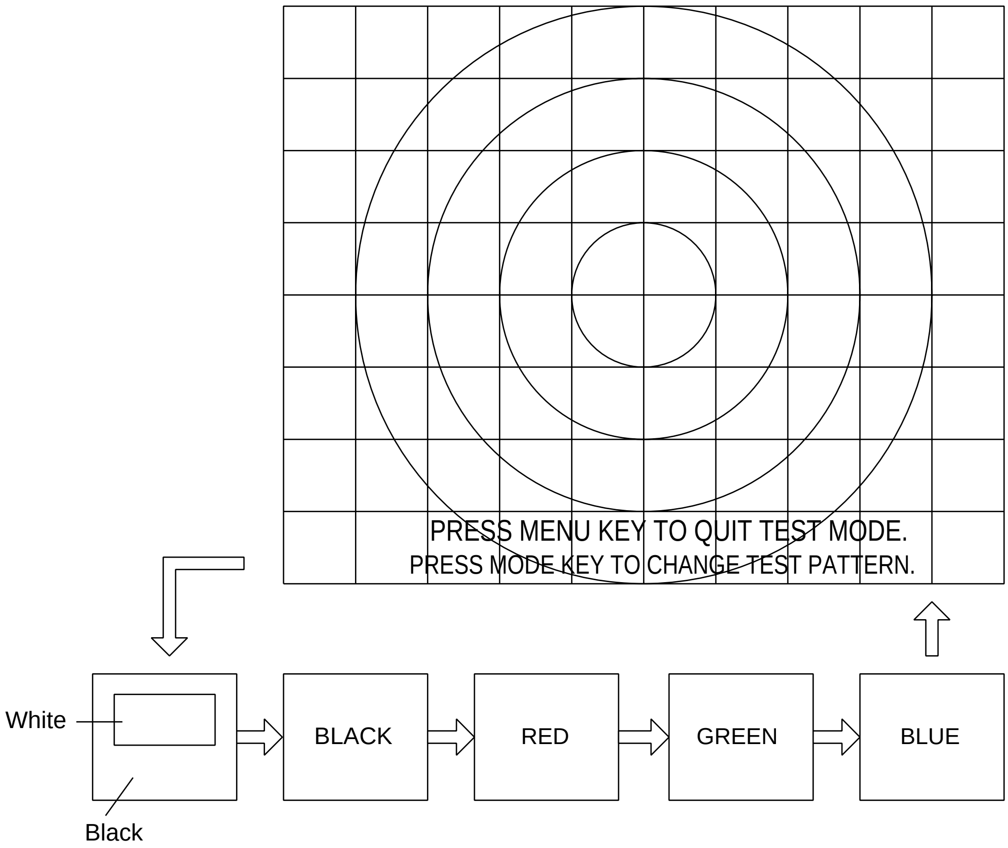
Trackball check: Operate the trackball. X-Y coordinates of trackball position are displayed. Normal conditions are as follows.

Rightward:	X positive
Leftward:	X negative
Upward:	Y positive
Downward:	Y negative

Lever check: Press the lever upward or downward. Normal conditions are 1 for upward and 2 for downward.

11.8.4 Test pattern

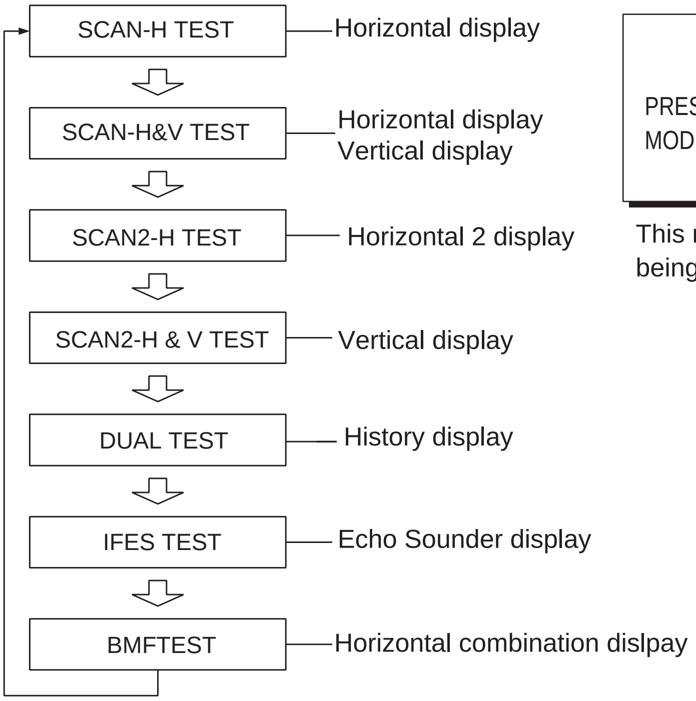
This test checks for proper display of colors and brilliance. Select TEST PATTERN from the TEST menu and press the [MENU] key to do this test. Use the [MODE] key to change the test pattern.



Test patterns

11.8.5 Rx test (For service technician)

This test inputs dummy data to each board and each board outputs a test pattern (32 color). Select RX TEST from the TEST menu and press the [MENU] key to do this test. Select the board to test with the [MODE] key, in the sequence shown below.



<<CHECKING RX >>

PRESS MENU KEY TO QUIT TEST MODE.
MODE : CHANGE DISP MODE.

This message appears while the Rx test is being conducted.

Rx test sequence, Rx test message

11.8.6 Noise test (For service technician)

This test measures noise level. Select NOISE TEST from the TEST menu and press the [MENU] key to conduct this test. The following message appears on the display while the test is being conducted. Use the [GAIN] control to adjust noise level to medium.

<< NOISE TEST >>

PRESS MENU KEY TO QUIT TEST MODE.
ADJUST NOISE LEVEL TO MEDIUM BY GAIN KNOB.

Noise test message

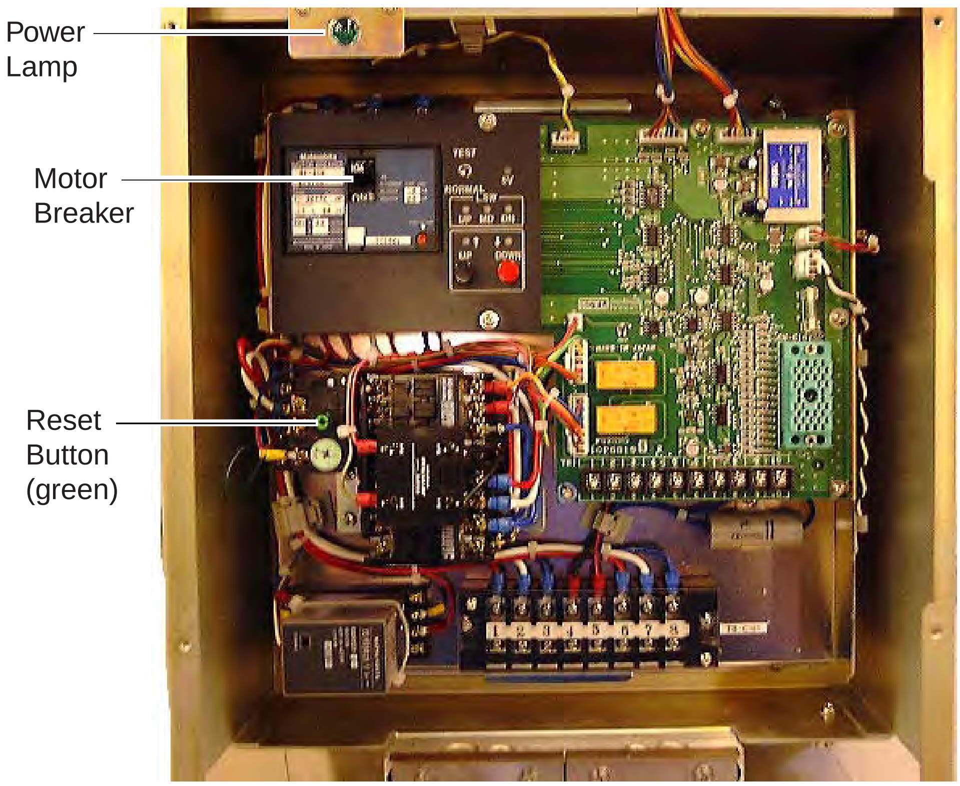
11.9 Raising the Transducer from the Hull Unit

If the transducer cannot be raised with the switches on the control unit, because it is tangled in the net or its shaft is bent, try to raise it from the hull unit, automatically or manually, whichever works.

11.9.1 Raising the transducer automatically

1. Turn off the monitor unit, transceiver unit and hull unit from the ship's mains breaker. (If the transducer cannot be retracted power cannot be turned off from the monitor unit.)
2. Check if the net or other object is caught in the transducer.
3. Look through the lid on the raise/lower control box in the hull unit to check if the motor breaker is OFF. If it is midway between ON and OFF, open the lid and turn it off and then on.
4. Unfasten six screws to remove the cover of the raise/lower control box.
5. Push the RESET button (green) on the raise/lower control box.
6. Close the cover.
7. Turn on the breaker at the ship's mains.
8. Turn on the equipment from the control unit.
9. Press the [🠅] key on the control unit to raise the transducer.

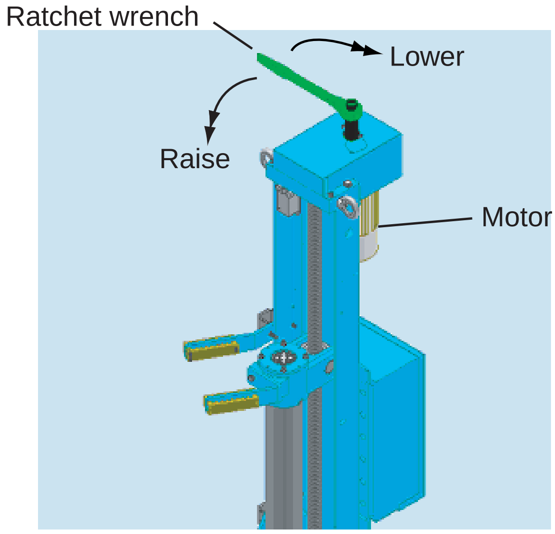
If the transducer cannot be raised, the shaft may be bent. In this case raise it manually with the hand crank, following the instructions on the next page.



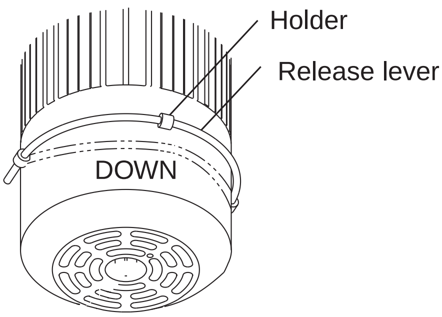
Raise/lower control box, cover removed

11.9.2 Raising the transducer manually

1. Open the lid on the raise/lower control box of the hull unit and turn off the motor breaker. Confirm that the power lamp is off. (See the illustration on the previous page for location of motor breaker and power lamp.)
2. Unscrew two screws to remove the cover.
3. Attach the ratchet wrench to the motor shaft, referring to the illustration below.

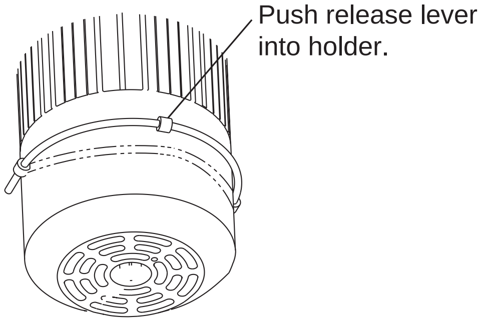


4. While holding the ratchet wrench, pull the release lever toward you and upward to release the brake.



Note: Hold the ratchet wrench when releasing the brake, to prevent the transducer from falling out.

5. Turn the ratchet wrench clockwise to raise the transducer.
6. After retracting the transducer into the tank, set the release lever to the holder as shown below.



MENU TREE

MENU key

- Default user menu:
  - TX PULSE LENGTH-H
  - TX POWER-H
  - TVG-NEAR-H
  - TVG-MEDIUM-H
  - TVG-FAR-H
  - AGC-H
  - 2ND AGC-H
  - ECHO AVERAGE-H
  - COLOR-H
  - COLOR RESPONSE-H
- H-SCAN SETTING...*2, *3
  - TX INTERVAL (0-9, ***9***) *1, *2
  - TX PULSE LENGTH (0-9, ***7***) *1, *2
  - TX POWER (0-9, ***9***) *1, *2
  - TVG-NEAR (-5 - 5, ***5***) *1, *2
  - TVG-MEDIUM (-5 - 5, ***4***) *1, *2
  - TVG-FAR (-5 - 5, ***2***) *1, *2
  - NOISE LIMITER (0-15, ***7***) *1, *2
  - REVERBERATION (0-3, ***0***) *1, *2
  - SIDELOBE SUPPRESS (-3 - 3.0, ***3***)
  - AGC (0-9, ***0***) *1, *2
  - 2ND AGC (0-12, ***4***) *1, *2
  - NEAR AGC (1-10, ***2***) *1, *2
  - ECHO AVERAGE (0-7, ***2***) *1, *2
  - INT REJECT (0-3, ***0***) *1, *2
  - BOTTOM SUPRESS (0-10, ***0***) *1, *2
  - FREQ SHIFT (-65-+65, ***0***) *1, *2
  - FREQ/BEARING SET (0-358, ***0***)*1, *2
  - OTHERS *2
    - COLOR (COLOR 1-4, ***2***) *1, *2
    - COLOR SETTING... (Sets echo level of colors.)
    - COLOR RESPONSE (COLOR CURVE 1-4, ***3***) *1, *2
    - COLOR RESPONSE... (Sets color response curve.)
    - GAIN OFFSET (0-12, ***5***) *1, *2
    - SIGNAL LEVEL (0-15, ***3***) *1, *2
    - FAR TVG CURVE (TVG1-4, ***3***) *1, *2
    - ABSORPTION COEFF (0.0dB-32.0dB, ***23.5dB***)
    - TVG DISTANCE... (Sets TVG curve.)
    - 2ND AGC DISTANCE (0-2000m, ***60m***)*1
    - NEAR AGC DISTANCE (20-300m, ***100m***)*1
    - SMOOTH ECHO RNG (0-3, ***2***) *1, *2
    - SMOOTH ECHO CIR (0-3, ***0***) *1, *2
    - GAIN CONTROL (NORMAL, ***WIDE***)
    - BEAMWIDTH...
      - BEAMWIDTH A (AR, -4 to +5, ***5***) *1, *2
      - BEAMWIDTH B (0-5, ***0***) *1, *2
- V-SCAN SETTING...*2
  - TX PULSE LENGTH (0-9, ***7***) *1, *2
  - TX POWER (0-9, ***9***)
  - TVG-NEAR (-5 - 5, ***5***) *1, *2
  - TVG-MEDIUM (-5 - 5, ***4***) *1, *2
  - TVG-FAR (-5 - 5, ***2***) *1, *2
  - NOISE LIMITER (0-15, ***7***) *1, *2
  - REVERBERATION (0-3, ***0***) *1, *2
  - SIDELOBE SUPPRESS (0-3, ***3***)
  - AGC (0-9, ***0***) *1, *2
  - 2ND AGC (0-12, ***4***) *1, *2
  - NEAR AGC (1-10, ***2***) *1, *2
  - ECHO AVERAGE (0-7, ***2***) *1, *2
  - INT REJECT (0-3, ***0***) *1, *2
  - BOTTOM SUPRESS (0-10, ***0***) *1, *2
  - FREQ SHIFT (-65-+65, ***0***) *1, *2
  - OTHERS *2
    - COLOR (COLOR 1-4, ***2***) *1, *2
    - COLOR SETTING... (Sets echo level of colors.)
    - COLOR RESPONSE (COLOR CURVE 1-4, ***3***) *1, *2
    - COLOR RESPONSE... (Sets color response curve.)
    - GAIN OFFSET (0-12, ***5***) *1, *2
    - SIGNAL LEVEL (0-15, ***3***) *1, *2
    - FAR TVG CURVE (TVG1-4, ***3***) *1, *2
    - ABSORPTION COEFF (0.0dB-32.0dB, ***23.5dB***)
    - TVG DISTANCE... (Sets TVG curve.)
    - 2ND AGC DISTANCE (0-2000m, ***60m***)*1
    - NEAR AGC DISTANCE (20-300m, ***100m***)*1
    - SMOOTH ECHO RNG (0-3, ***2***) *1, *2
    - SMOOTH ECHO CIR (0-3, ***0***) *1, *2
    - GAIN CONTROL (NORMAL, ***WIDE***)
    - BEAMWIDTH...
      - BEAMWIDTH A (0-5, ***5***) *1, *2
      - BEAMWIDTH B (0-5, ***0***) *1, *2
    - DISPLAY POSITION (***LEFT***, RIGHT) *1, *2
    - VERTICAL SIZE (***FULL***, HALF) *1, *2
- OTHERS... *2
- (See next page.)

Default settings in bold italic.

**1: Items which can be programmed to the user menu. See page 8-2.*
**2: Items which can be programmed to a function key. See page 8-6.*
**3: S-SCAN SETTING shown when Slant mode is active. Menu items are same as in H-SCAN SETTING menu.*

- OTHERS
  - ES1 SETTING... *2
    - GAIN (0-10, ***5***) *1, *2
    - RANGE (20-320 m, ***160 m***) *1, *2
    - SHIFT (0-1000 m, ***0 m***) *1, *2
    - CLUTTER (0-10, ***0***) *1, *2
    - SIGNAL LEVEL (0-9, ***0***) *1, *2
    - INT REJECT (***OFF***, ON) *1, *2
    - PICTURE ADVANCE (***1/1***, 1/2, 1/4, 1/8, SPEED SYNC)
    - PICT ADVC AT SHOOT (ADV AT SHOOT, ***SPEED SYNC***)
    - COLOR SETTING... (Sets echo level of selected color.)
    - COLOR RESPONSE... (Sets echo level vs. echo strength.)
    - SCALE POSITION (***RIGHT***, LEFT)
  - ES2 SETTING... *2
    - GAIN (0-10, ***5***)
    - RANGE (20, 40, 60, 80, 120, ***160***, 240, 320 m, INTERLOCK) *1, *2
      [RANGE BELOW NET* (20, 40, 60, 80, 120, ***160***, 240, 320 m)] *1, *2
    - SHIFT (0-1000 m, INTERLOCK**, ***0 m***) *1, *2
      [RANGE UPPER NET* (20, 40, 60, 80, ***160***, 240, 320 m)] *1, *2
    - CLUTTER (0-10, ***0***) *1, *2
    - SIGNAL LEVEL (0-9, ***0***) *1, *2
    - INT REJECT (***OFF***, ON) *1, *2
    - PICTURE ADVANCE (***1/1***, 1/2, 1/4, 1/8, SPEED SYNC)
    - COLOR SETTING... (Sets echo level of selected color.)
    - COLOR RESPONSE... (Sets echo level vs. echo strength.)
    - NET RECORDER DISP (***DOWN***, UP/DOWN)
    - NET RECORDER RANGE (80-640 m, ***80 m***)

** = Displayed with net recorder connection*
*** = INTERLOCK of SHIFT is effective if INTERLOCK of RANGE is selected.*

  - ERASE MARKS... *2
    - EVENT MARK (Deletes event marks.) *1, *2
    - FISH MARK (Deletes fish marks.) *1, *2
    - OWN SHIP POS MARK (Deletes own ship position marks.) *1, *2
    - SHIP'S TRACK (Deletes ship's track.) *1, *2
  - DISPLAY SETTING... *2
    - DISPLAY MODE... (H1, S, H1&H2, H&S, V1, V1&V2, V1&ES1, V1&ES2, HISTORY, ES1, ES2, ES1&ES)
    - MODE SELECTION (***MODE KEY***, PULL-DOWN MENU)
    - TX/RX MODE (***ALTERNATIVE***, MULTI)
    - H2/S DISPLAY (***LANDSCAPE,*** PORTRAIT, RIGHT INSET, LEFT INSET) *1, *2
    - PRESENTATION MODE (***HEAD UP***, NORTH UP, COURSE UP, TRUE MOTION) *1, *2
    - TM DISPLAY RANGE (1.3R, ***1.6 R***)
    - BEARING REF (***SHIP HEADING***, NORTH) *2
    - TILT LEVER (***TILT***, TILT&V1)
    - S AUTO OFF CENTER (***OFF***, ON)
    - H-SLICE WIDTH (1, 2, 4, 8, ***16***, 32)
    - H-SLICE PICT ADVC (***KP SYNC***, SPEED SYNC)
    - NET COURSE MARK (ENTER, DELETE) *1, *2
    - MANUAL DEGAUSS (Manually degausses screen; supplied monitor only.) *1, *2
    - AUTO DEGAUSS (OFF, TIMER, GYRO, ***INT SENSOR***)
    - DIMMER (1-10, ***10***) *1, *2
    - KEY BEEP VOLUME (0-7, ***5***)
  - ALARM & AUDIO...*2
    - FISH ALARM (***OFF***, ON)
    - ALARM LEVEL (0-30, ***16***)
    - ALARM ZONE... (Sets fish alarm zone.)
    - SHIP SPEED ALARM (OFF, ***ON)***
    - AUDIO (OFF, ***ON***)
    - AUDIO SECTOR (***30°***, 60°, 90°, 180°, 330°)
    - REVERBERATION (0-9, ***0***)
  - PRESET, MEMORY CARD... *2
    - ASSIGN USER PROG (Programs USER PROG control. Default menu item.)
    - CLEAR F-KEY SETTING (Programs function keys.)
    - H/S-SCAN RANGE (60-2000 m, Defaults: 100, 200, 400, 600, 800, 1000 (m))
    - V-SCAN RANGE(60-2000 m, Defaults: 100, 200, 400, 600, 800, 1000 (m))
    - PICTURE SHOT (Stores current picture in memory.) *1, *2
    - PICTURE RECALL (Recalls picture in memory.) *1, *2
    - MEMORY CARD... (Menu for formatting, saving, replaying menu cards.) *2

(Continued on next page)

- INITIAL SETTING... *2
  - MARK DISPLAY... *2
    - HEADING MARK (OFF, ***ON***)
    - RANGE RINGS (OFF, ***ON***)
    - BEARING SCALE (OFF, ***ON***)
    - SHIP'S TRACK (OFF, ***ON***)
    - DATA ON TRACK (***OFF***, WATER TEMP, DEPTH)
    - NET MOVEMENT PLOT (OFF, ***ON***)
    - FISH MARK CONNECT (OFF, ***ON***)
    - TARGET VECTOR (OFF, ***ON***)
    - FISH TRACK PLOT (OFF, ***ON***)
    - FISH HISTOGRAM (OFF, ***ON***)
  - MARK SIZE... *2
    - TRACKBALL MARK (***+SMALL***, +LARGE, ■SMALL, ■LARGE)
    - TARGET LOCK MARK (***SMALL***, LARGE)
    - TARGET VECTOR (SHORT, ***NORMAL***, LONG)
    - EVENT MARK (SMALL, ***LARGE***)
    - FISH MARK (SMALL, ***LARGE***)
    - OWN SHIP POS MARK (***SMALL***, LARGE)
    - OWN SHIP MARK (STANDARD, LARGE, ***ACTUAL***)
    - NET SHOOT MARK (***SMALL***, LARGE)
    - ESTIMATE ON SCAN (SMALL, ***LARGE***)
    - ESTIMATE ON ES (***1/8***, 1/4, 1/2)
    - CURRENT VECTOR (***SHORT***, LONG)
    - RANGE RINGS (1/2R, ***1/4R***)
    - SHIP'S TRACK MARK (***5R***, 10R, 20R, 40R)
  - DATA DISPLAY... *2
    - RANGE&BEARING (OFF, ***ON***)
    - CURSOR POSITION (***OFF***, ON)
    - COURSE (***32 CMPS***, 360° TRUE, 360° REL, 180° REL)
    - CURRENT DATA (32 CMPS, ***360° TRUE***, 360° REL, 180° REL)
    - EVENT MARK (***32 CMPS***, 360° TRUE, 360° REL, 180° REL)
    - OTHER MARKS (32 CMPS, 360° TRUE, 360° REL, ***180° REL***)
    - DISTANCE FOR SHOOT (***MILE***, METER, FEET)
    - WATER TEMP (***°C***, °F)
  - CURRENT VEC & WIND... *2
    - CURRENT DATA (***ABSOLUTE***, REL TO LAYER1, REL TO LAYER2, REL TO LAYER3) *2
    - ON OWN SHIP MARK (OFF, ***ON***)
    - ON SHIP POS MARK (OFF, ***ON***)
    - ON NET SHOOT MARK (OFF, ***ON***)
    - CURRENT FLOW DIR (***TO***, FROM)
    - WIND (***OFF***, RELATIVE, ABSOLUTE) *2
  - NET SONDE SETTING... *2
    - NUMBER OF XMTR (0-10, ***3***)
    - XMTR DISTANCE...
      - END OF NET TO S1 (0-1000 m, ***400 m***)
      - S1 TO S2 (0-1000 m, ***400 m***)
      - S2 TO S3 (0-1000 m, ***400 m***)
      - S3 TO S4 (0-1000 m, ***400 m***)
      - S4 TO S5 (0-1000 m, ***400 m***)
      - S5 TO S6 (0-1000 m, ***400 m***)
      - S6 TO S7 (0-1000 m, ***400 m***)
      - S7 TO S8 (0-1000 m, ***400 m***)
      - S8 TO S9 (0-1000 m, ***400 m***)
      - S9 TO S10 (0-1000 m, ***400 m***)
    - NET LENGTH (500-3000 m, ***1800 m***)
    - DEPTH DISPLAY... (S1-S10, ***S1-S3***)

(Continued on next page.)

- NET SHOOT SETTING... *2
  - NET DIAMETER (200-1000 m, ***500 m***)
  - TILT INTERLOCK (OFF, ***ON***)
  - NET PLOT CORR-LYR1 (0-100%, ***50%***)
  - NET PLOT CORR-LYR2 (0-100%, ***50%***)
  - NET PLOT CORR-LYR3 (0-100%, ***50%***)
- TARGET LOCK... *2
  - TRACKING METHOD (TARGET MARK, ***FISH***) *1, *2
  - TILT INTERLOCK (OFF, TILT, ***TILT&RANGE***)
  - MARK INERLOCK (OFF, ***ESTIMATE MARK***, EST&HISTOGRAM)
  - TRACKING DATA (HORIZONTAL/SLANT, ***H&V***)
  - THRESHOLD (1-30, ***16***)
  - BOTTOM THRESHOLD (0-5, ***3***)
  - TARGET SPEED LIMIT (1-15 kt, ***5 kt***)
  - SMOOTHING (0.0-1.0, ***0.5***)
  - TARGET SPD UPDATE (15sec, 30sec, 45sec, ***60sec***)
  - TARGET LOCK WINDOW (***NORMAL***, LARGE, LARGEST)
  - DIMENSION SETUP (0-100t, 25t/1000m^2)
  - VOLUME SETUP (0-100t, 25t/1000m^3)
- STABILIZATION... *2
  - STABILIZATION (OFF, ***ON***)
  - PITCH ANGLE COR (-10.0 - +10.0, ***0.0***)
  - ROLL ANGLE COR (-10.0 - +10.0, ***0.0***)
  - SENSOR (***STANDARD***, GPS GYRO)
- TEST... *2
  - BOARD TEST... (Tests circuit boards.)
  - PANEL TEST... (Tests control panel.)
  - TEST PATTERN... (Displays test patterns.)
  - RX TEST... (Checks receiver.)
  - NOISE TEST... (Executes noise test.)
  - TX (ON, ***OFF***) *1, *2
- INITIALIZATION... *2
  - SAVE SHIP'S ORG
  - RECALL SHIP'S ORG *1
  - SET TO DEFAULT (Restores all default settings.)
  - ITEM ATTRIBUTION (***NON-CHANGEABLE***, CHANGEABLE)
  - TIME OFFSET... (Sets time difference between UTC and local time.)

SPECIFICATIONS OF THE COLOR SCANNING SONAR FSV-84

1 GENERAL

1.1 Scanning method Continuous scanning beam forming

1.2 Frequency 80 kHz

1.3 Range, TX cycle and Pulse-length

Basic Range (m)	Range (m)	
	Offcenter 'ON'	Offcenter 'OFF'
60	0-60	0-96
100	0-100	0-160
150	0-150	0-240
200	0-200	0-320
300	0-300	0-480
400	0-400	0-640
500	0-500	0-800
600	0-600	0-960
700	0-700	0-1120
800	0-800	0-1280
900	0-900	0-1440
1000	0-1000	0-1600
1100	0-1100	0-1760
1200	0-1200	0-1920
1400	0-1400	0-2240
1600	0-1600	0-2560
2000	0-2000	0-3200

1.4 Audio Search 30°, 60°, 90°, 180°, 330°, selectable

1.5 Audio Output 1.1 W (4 ohm)

1.6 Audio Frequency 1.0 kHz

2 DISPLAY UNIT

2.1 Display Tube PPI display on 21-inch high-resolution color CRT (for separate type), 1280(H) × 1024(V) dots

2.2 Color 32 colors (sonar picture), 16 colors (echo sounder), 4 colors (marks)

2.3 Orientation Head-up, North-up*, True-motion* and Course-up*

2.4 Presentation Mode Horizontal, Sonar, Horizontal 2, S-scan, S-scan combination, Vertical 1, Vertical 2, Vertical scan 1 + Echo sounder, History, Echo sounder 1, Echo sounder 2, Echo sounder 1 + Echo sounder 2

2.5 Features — Custom mode, interference rejector, afterglow, noise limiter, color erasure, memory card (save and recall of picture, setting data), automatic tilt, automatic target tracking* (target lock), fish alarm, over-voltage warning, unretracted transducer warning

*: Appropriate sensor required

3 TRANSCEIVER UNIT

3.1	Transmitter	PDM half-bridge
3.2	Receiving method	Straight amplifier, full digital beam forming
3.3	Horizontal Tx Beamwidth	Horizontal 360° × Vertical 10.7° (-6 dB full width)
3.4	Horizontal Rx Beamwidth	Horizontal 12.6° ×Vertical 10.1° (-6 dB, full width)
3.5	Tilt Angle	-5° to 90°
3.6	Vertical Tx Beamwidth	Horizontal 12.7° × Vertical 118.2° (-6 dB, full width)
3.7	Vertical Rx Beamwidth	Horizontal 12.6° × Vertical 12.1° (-6 dB, full width)
3.8	Vertical Search Range	0° to 90°
3.9	S Tx Beamwidth	Horizontal 206.7° × Vertical 12.1° (-6 dB, full width)
3.10	S RX Beam width	Horizontal 12.6° × Vertical 12.0° (-6 dB, full width)
3.11	Tilt Angle	-5° to 90°

4 HULL UNIT

Type	FSV-8432	FSV-8442
XDCR travel	500/800 mm	800/1100 mm
Raise/Lower Time	21 sec	28 sec
Allowable ship's speed (Raise/lower operation)	18 knots (18 knots)	15 knots (15 knots)

5 DATA IO

5.1	Input (NMEA 0183)	CUR, DBS, DBT, DPT, GGA, GLL, HCC, HCD, HDG, HDM, HDT, MTW, MWV, RMA, RMC, VBW, VDR, VHW, VTG, VWT, ZDA, GNS
5.2	CIF Input Data	System clock, position, speed, bearing, first layer current data, water depth, water temperature, multi-layer current data, net depth, wind
5.3	Output (NMEA 0183)	TLL

6 POWER SUPPLY

6.1	Processor Unit, Control Unit, Display Unit	
		100-115/200-230 VAC, 1 phase, 50/60 Hz, 5 A
	Processor Unit, Control Unit	
		100-115/200-230 VAC, 1 phase, 50/60 Hz, 2 A
6.2	Transceiver Unit	100/110/115/200/230 VAC, 1 phase, 50/60 Hz, 15 A
6.3	Hull Unit	200-220 VAC, 3 phase, 50/60 Hz, 4 A

7 ENVIRONMENTAL CONDITIONS

7.1	Ambient Temperature	
	Transducer:	-5°C to +35°C
	Other units:	0°C to +50°C
7.2	Relative Humidity	95% at 40°C
7.3	Vibration	IEC 60945 4 ed.
7.4	Waterproofing (IEC 60529)	
	Display Unit:	No protection (IEC: IPX0) Display panel: IPX2
	Control Unit:	No protection (IEC: IPX0) Panel: IPX2
	Transceiver Unit	No protection (IEC: IPX0)
	Hull Unit:	Burstproof (IEC: IPX2)
	Transducer:	IPX8

8 COATING COLOR

8.1	Display Unit	2.5GY5/1.5
8.2	Processor Unit	2.5GY5/1.5
8.3	Control Unit	Panel: N3.0, No.535
8.4	Transceiver Unit	2.5G7/2
8.5	Hull Unit	2.5G7/2

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